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RAILROAD

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WORK OF RAILWAYS MINISTRY REPAIR PLANTS DISCUSSED

Moscow ZHELEZNODOROZHNYY TRANSPORT in Russian No 1, 1982 pp 5-11

[Article by A. T. Golovatyy, deputy minister of USSR Railways, chief of Main Administration for Repair of Rolling Stock and Production of Spare Parts]

[Text] The repair plants of MPS [Ministry of Railways] is one of the most important sectors of railway transport and they guarantee efficient functioning of the system for planned preventive repairs of rolling stock and other equipment. The level and quality of the transshipping process, meeting the transport needs of the national economy and of the populace and the traffic safety of trains depend largely on rhythmic and clear operation of the plants.

The communist party and the Soviet government are constantly concerned about universal development of railway transport and of strengthening and expanding its repair base. This is clearly indicated, specifically by the decree of the CPSU Central Committee and the USSR Council of Ministers "On measures to improve the operation and complex development of railway transport during 1981-1985." The problems relating to this have been reflected in the "Basic directions for economic and social development of the USSR for 1981-1985 and for the period up to 1990," adopted by the 26th CPSU Congress. All this is a reliable basis for further successful development of the plant repair base of the railroads. At the same time much must be done in this field by the workers of the transport repair industry themselves.

The plants of MPS on the whole fulfilled the plan of the 10th Five-Year Plan in the volume of production and the increase of labor productivity and profits. During this period the volume of production increased by 21.6 percent (with a planned 21.5 percent), products worth 193 million rubles were sold above the five-year plan, labor productivity increased by 19.3 percent and 15.1 million rubles profit above the plan were received. In 1981 the profits plan was fulfilled as a whole by plants of the Main Administration. The plan for commercial products was fulfilled by 100.1 percent in comparable prices and the volume of production of industrial products increased by 1.4 percent compared to 1980.

It is planned to increase significantly the volume of production during the 11th Five-Year Plan, primarily by increasing the output of rolling stock repairs. On the whole, the increase of the volume of production during the

five-year plan should reach 15 percent. In this case repair of diesel locomotives will increase by 13.6 percent, repair of electric locomotives will increase by 13.6 percent, repair of electric trains will increase by 16.2 percent, repair of diesel trains will increase by 17.6 percent, repair of passenger rail cars will increase by 14.7 percent, repair of freight cars will increase by 14.8 percent, repair of traction electric motors of diesel locomotives will increase by 51.7 percent. Deliveries of spare parts to the railroads will increase at high rates: by 37.6 percent for diesel type sleeves, by 19.4 percent for pistons and by 13.3 percent for piston rings. This means that by 1985 the needs of the railroads for repair and spare parts for diesel locomotives and electric rolling stock will mainly be met. The level of support of the needs of the operators and in repair of rail cars will be increased significantly.

Wide production of cultural-service and economic consumer goods has now been organized at practically all plants of the Main Administration. Various types of furniture, hardware and locks, farming and garden and orchard tools, automotive accessories and spare parts, sports inventory and much more in demand by the population--more than 500 items in total complexity--are produced. Production of consumer goods at plants will increase from year to year and their variety will be constantly improved and quality will be continuously renewed and quality will be improved.

A total of 23 specialized sections was created, a shop was put into operation at the Daugavpils Locomotive Repair Plant and the previously existing production capacities were considerably expanded and reconstructed during the 10th Five-Year Plan at plants of the Main Administration to increase production and to improve the quality of these goods. Because of this consumer goods with 51.5 million rubles were produced and more than 100 new types of articles were assimilated by the plants during the five-year plan. Based on future orders of trade organizations and the conditions of annual trade fairs, the variety of goods is being continuously renewed, the technology of their manufacture is being improved, modern coatings are being introduced and so on. Thus, in 1981 the plants assimilatd more than 30 additional nomenclatures of new articles. Three plants--the Voronezh and Tambov Rail Car Repair plants and the Rostov Electric Locomotive Repair Plant--additionally organized specialized sections.

The decrees of the CPSU Central Committee and the USSR Council of Ministers "On measures to increase production of goods for primary needs in 1981-1985 and to more fully meet the demand of the populace for these goods" and "On increasing the production of consumer goods and increasing the quality and improving their variety in 1981-1985" place new tasks before the Main Administration and plants to assimilate the best models of future goods, to meet the needs of the populace for these articles and fundamental improvement of their technical and aesthetic indices. Further expansion of production and renewal of the variety and improvement of the quality of goods produced are planned in this regard during the 11th Five-Year Plan. It is planned to increase the output of these articles no less than 1.4-fold, to assimilate 50 nomenclatures of goods not previously produced by the plants, to introduce 27 new specialized sections, to introduce modern production processes and to acquire high-performance specialized equipment.

Technical Progress and Intensification of Production

An increase of labor resources is limited, as is known, during the current five-year plan in the country. Therefore, an important task of plants of MPS is to increase the capacities and efficiency of production by intensification of it. The complex indicator of the level of intensification of production is labor productivity, acceleration of its increase is of primary significance for successful fulfillment of the plans of the 11th Five-Year Plan. And increase of labor productivity by only 1 percent permits an increase of product output worth 15.0 million rubles annually as a whole throughout plants of MPS.

Scientific and technical progress must be universally accelerated and laborious processes must be mechanized and automated for further increasing labor productivity. Production conveyor lines for repair of rolling stock have been developed and actively introduced at the Daugavpils, Michurinsk, Dnepropetrovsk Diesel Locomotive Repair Plants, the Izyumy, Panyutino Kanash, Darnitskiy and Dnepropetrovsk Rail Car Repair Plants and other leading plants for this purpose. The operating experience of the Daugavpils plant showed high economic effectiveness of this method. Thus, in 1981 the plant exceeded its own design capacity for repair diesel locomotive sections 1.7-fold.

It should be noted that introduction of the production conveyor method of repair requires a high degree of organization of work of all shops, sections and other subdivisions of the enterprise without exception. The procurement shops and the material-technical support service should primarily operate clearly and without interruption. After all, the slightest disruption in support of the conveyor by one or another assemblies causes a breakdown of its rhythm which is very difficult to restore. Moreover, the rhythm of operation of the repair conveyors largely depends on the timeliness of cooperative deliveries of spare parts manufactured at other plants.

A dynamic and highly effective method of intensification of production is technical re-equipping. Replacement of worn and obsolete equipment with more modern and high-performance equipment has the greatest effect, especially in reconstruction and expansion of enterprises. Our plants should receive 40 automatic lines, more than 200 machine tools with numerical program control, approximately 1,000 special machine tools and a large number of high-performance forge and press equipment during the current five-year plan.

Practice has convincingly demonstrated that the basis for intensification of production is to increase its quality in the broad sense of the word. An increase of production quality is understood here as development of essentially new production processes, development and use of structural materials that differ advantageously from traditional materials and introduction of new more reliable assemblies and parts which can operate in previously developed basic designs of locomotives and rail cars.

It should be said that specific success has been achieved in this regard. Specifically, improved pistons, sleeves, flexible gear drives, piston rings of high-strength chrome-plated cast iron, rodding shafts and elastic wheels of the cooling blower of traction engines have been developed, tested and

yield a significant increase of service life of locomotives. This is far from a complete list of the highly effective design changes of assemblies and parts which operate considerably better and can be installed instead of obsolete designs.

Essentially new production processes that considerably increase quality and accordingly the service life of one or another part are being developed and introduced at the same time at the plants. For example, the pinions of the traction reducer are manufactured at the Lyublino Casting Machine Plant by the method of rolling the teeth on a special mill designed and manufactured under the supervision of Academician A. I. Tselikov. In this case the metal fibers are not cut but acquire the shape of the tooth, which together with the special heat treatment, considerably extends the service life of the pinions. The workers of this enterprise have designed and manufactured a special installation to rivet cylindrical springs of locomotives and rail cars with steel shot. A technique of casting rail car parts--beams, sides of carriers, automatic coupling heads, traction clips and so on--from higher quality steel has been developed and introduced here. As a result the strength of these articles was increased by more than 30 percent.

A technique for centrifugal casting of piston ring blanks has been introduced at the Astrakhan and Novosibirsk Electric Locomotive Repair Plants and the Velikiya Luki Plant. High-phosphorous rail car brake shoes with wear resistance increased more than twofold have successfully passed tests. The shaking molding machines in casting of ordinary rail car brake shoes will be replaced by automatic lines with flaskless molding. A method of casting in a lined crucible has been used at the Dnepropetrovsk Diesel Locomotive Repair Plant to cast cylinder sleeve blanks. A semiautomatic line to fire the pulverized bakelite mixtures into the crucible has been manufactured at the Tiraspol' Casting Machine Plant, which considerably increases productivity and improves the working conditions in the foundry. Many of these examples could be presented.

The quality of plant repair of rolling stock now largely depends on normative documentation by which repair of one or another assembly is made. The time has come to bring restoration of no less than 80 percent of the service life available in new rolling stock in plant repair, especially of diesel locomotives. The existing regulations for repair toward making them more rigid need to be reviewed in the near future. Moreover, taking into account the operating experience, the list of assemblies, parts and units (such as the vertical driver of the 10D100 diesel, all types of reducers, traction reducer pinions, the tread bands of wheel pairs and so on) must be expanded which should be replaced with new ones without fail in plant repairs.

On the one hand, this will permit a considerable increase of the quality of plant repair and on the other hand, it will provide an opportunity to support the depot with the necessary number of assemblies, parts and units due to those taken from rolling stock that has come in for repair. In this case the assemblies and parts should be replaced at the plants by more reliable assemblies and parts having longer service life. A sharp increase of the need for spare parts will not occur with this method since all the assemblies

and parts taken from the rolling stock to be repaired will be restored to nominal parameters and sent to the depots. It is natural that all this requires centralized repair of assemblies and units at plants of MPS.

As the first steps to introduction of this system, it is planned to organize repair of splined shafts at the Krasnyy Put' Plant and to restore the worn surfaces of beams and valances above the springs at the Darnitskiy Plant, of the drive shafts of type D6 and D12 diesels at the Saran Plant, of the drive shafts of diesels of BMZ refrigerator sections at the Konotop Plant and of B-5 refrigerator sections at the Tambov Plant. Some change of the system of supporting the railroads with spare parts is required in this regard. Specifically, collection and dispatch of assemblies and units to plants of MPS, which they do not now repair for the railroads, will have to be provided. One can calculate that this measure will in the final analysis increase the repair capacities of depot shops on the railroads.

For better utilization of the service life of the main assemblies and units, a system for replacing them has been developed at plants that usually guarantees completion of the service life of one or another assembly, unit or part with guarantee of totally dependable operation of it. For example, taking into account that three grades are made between plant repairs of a diesel engine in the depot, the sleeves and pistons, piston pins, piston insert bushings and upper crankhead, piston rings, linings of all types and so on must be replaced with new or repaired ones during the second of them, i.e., during the middle of the mileage between plant repairs. As a result the operating reliability of diesel locomotives is increased and better use of spare parts will be guaranteed.

Calculations carried out by specialists of the PKTB [Planning and Design Technological Bureau] of the Main Administration, show that, having adopted this system, the consumption of spare parts can be reduced by 30 percent. However, the output of the corresponding spare parts must be increased singificantly to introduce it initially. The need for them is subsequently reduced even compared to the existing need. There are real opportunities in 1982 to organize introduction of the indicated system on 2-3 railroads, for example, the Alma-Ata, Central Asian and Volga area. The indicated work could be fully completed within two years on these railroads and a significant saving could be achieved primarily by increasing the operating reliability of the locomotive pool and also as a result of a sharp reduction of spare parts consumption. The need for labor resources would be also reduced significantly, which is especially important at present. At the same time the system will provide high-quality repair of assemblies and units of locomotives under plant conditions.

Specialization, Reconstruction and Cooperation

An enormous saving can be achieved by specialization of production. In this regard the Saransk Plant will be specialized in repair of type D100 diesels for depots and other plants, the Ufa Plant will be respecialized to repair TEM2 diesel locomotives and the Ussuriy and Tashkent Plants will repair only 2TE10 diesel locomotives of all modifications.

The production capacities of the Smela Plant are being developed at accelerated rates to support the repair enterprises with traction electric engines, the corresponding shops at the Ussuriy, Orenburg and Alma-Ata Plants will be put into operation and begin repair of engines and a shop at the Voronezh Diesel Locomotive Repair Plant will be put into operation this year. With regard to the fact that modernization of traction engines will permit an increase of their service life, one can figure that the needs of transport for repair of traction engines will mainly be guaranteed by the end of the five-year plan.

The capacities of the Dnepropetrovsk Diesel Locomotive Repair Plant are being increased and new capacities are being developed at the Daugavpils Plant to increase the output of sleeves for diesel locomotives. Pistons will be manufactured on two automatic lines of the Lyublino Plant. Capacities are being developed to produce piston rings at the Orenburg Plant. Capacities for manufacturing traction reducer pinions are being expanded at the Lyublino and Gayvaron Plants. The output of reducer pinions and radiator sections for the cooling system of diesel locomotives will increase considerably at the Ishim Plant.

Reconstruction of the Dnepropetrovsk Switch Plant and the first units of reconstruction of the Novosibirsk Switch Plant and the Muromo Plant will be completed during the current five-year plant to increase the volume of production of switch settings and individual frogs. The capacities of steel castings will be increased significantly and production of automatic shaping lines for small carbon casting and sand flinger units for large casting from manganese steel will be put into production. Large specialized machine tools, including those with numerical program control, will find broad application in machining.

At the same time it is planned to increase significantly the volume of output of switch settings with continuous rolling surface and switches without cast cores. This increases somewhat the laboriousness of machining of switches but also permits a sharp reduction of the need for expensive and still scarce high-manganese steel casting. According to data of VNIIZhT [All-Union Scientific Research Institute of Railway Transport], the service life of these switch settings will increase 2-3-fold. At the same time no large increase of the output of switch settings should be expected as a whole up to 1985 since reconstruction of switch plant shops will be completed only at the end of the five-year plan.

A broad program has been developed in the field of producing car retarders; it envisions total satisfaction of the needs of the railroads for this product by 1985. Two additional plants--the Kaluga and Alatyr--are now being connected to the plants that produce car retarders. The necessary capacities are being created here to produce car retarders and equipment to control them. Specialization of existing plants is being carried out, which will permit a considerable increase of the output of retarders from the same production areas. A significant factor that contributes to increasing the output of retarders is variation of some of their design components. Specifically, part of the cast parts of retarders is being replaced by welded parts. Increased attention

has been devoted to development of production of car retarders of the third brake position, installed on each track of the suburban fleet, to eliminate the dangerous and hard occupation of shoemakers.

One of the important tasks is to increase the output of containers. It will be solved mainly by introduction of new capacities to produce containers at the Gryazi-Orlov Plant. All efforts must be applied to assimilate these capacities as soon as possible.

Problems of supporting the railroads and repair plants with spare parts occupy a special place. This is the most acute and urgent problem. The technical state of rolling stock and observance of the established system of planned and preventive repairs on the line depend largely on timely and total support of repair enterprises with spare parts, primarily for diesel engines.

In most cases we must organize production of spare parts, assemblies and entire units at our own plants, since industry satisfies no more than 50 percent of our needs for them. This naturally reduces the capabilities of plants of MPS in the basic products--high-quality repair of rolling stock. Unfortunately, there is as yet no clear distribution of the nomenclature for output of spare parts between the ministries building the rolling and the MPS. As a result there is clearly inefficient parallel production of one or another spare parts at many plants of industry and MPS, which does not permit efficient utilization of high-performance equipment and automatic lines for their manufacture.

Automatic and semiautomatic lines or machine tools are already used in some cases at plants of MPS, while these parts are made on general-purpose equipment at the plants of industry. For example, pistons for type D100 diesels are manufactured by the Plant imeni Malyshev on general-purpose machine tools, while they are produced on automatic lines at the Lyublino Casting and Machine Plant, which is more productive and less expensive. At the same time, pistons for type D diesels are manufactured at our plants on general-purpose machine tools, while the plants of industry make them on automatic lines. Specialists of MPS have developed semiautomatic machine tools for production of piston rings which increase the productivity of individual operations 4-5-fold, while piston rings are machined on general-purpose equipment at the Kolomna and Khar'kov Plants. And there are many such examples.

Strict specialization and linkage of the operation of the plants of industry and MPS and overcoming their agency dispersion are required to eliminate this parallellism in manufacture of spare parts, assemblies and units, which is harmful for the overall matter. This is true primarily of mass spare parts, assemblies and units. Such an important state task can be solved by the directive organizations and of course the economic effectiveness of this cannot be calculated only within MPS or, let us say, Mintyazhmash [Ministry of Heavy Machine Building]. The saving achieved here is complex in nature and is manifested in scales of the entire national economy.

Nevertheless, we can count on meeting the needs of the railroads for such basic diesel spare parts, primarily for mainline locomotives as sleeves, pistons, piston rings, traction reducer pinions, wheel pairs and so on.

Many years of experience permits serious claims against some ministries of industry. For example, Minelektrotekhprom [Ministry of the Electrotechnical Industry] has not been supporting transport with reliable diesel traction engines for a long time. It is difficult to understand why they still have no forced lubrication system, why they are produced with an iron core, which is pressed against the shaft of the traction engine, rather than a special bushing. And after all a design with a bushing permits a saving of many tons of winding wires during repair, since the entire armature winding must now be changed with any damage of the shaft, collector or packing washers.

Minstankoprom [Ministry of the Machine Tool Industry] has delivered to MPS only two types of automatic lines, although the railroad workers needs a considerably greater number of them than the machine builders that produce rolling stock. The experience of using automatic lines to manufacture pistons for type D100 diesels confirmed their high economic effectiveness. But the machine tool builders refuse to manufacture automatic lines for us to produce the sleeves of working cylinders, cooling sleeves and piston rings for the type D100 diesels. The repair plants have no specialized automatic lines to mold brake shoes, which they manufacture in the millions, and cannot produce automatic lines to machine car axles, cast car axle boxes for roller bearings and no automatic lines to shape new wheel pairs. The plants also need special machine tools to machine the worn surfaces of the beams above the springs, automatic lines for winding coil springs and so on.

One cannot cope with the fact that the service life of cables of large cross-section and adjusting wires is less than that provided by the GOS [State Standard], which, instead of coil wires with PETVSD insulation that are reliable in operation and durable, the plants receive wires of types PDA and PSD that quickly fail. After all, the use of type PETVSD insulation increases 1.5-fold the service life of traction electric engines.

It is not completely clear why industry delivers to us freight and passenger cars with bodies of ordinary steel, which is so damaged by corrosion within 10 years that it sometimes requires 100 percent replacement. The roofs of closed cars and the pipes of the heating and braking systems of all types of cars are also made from ordinary, rather than galvanized metal. As a result there is unjustified replacement of a large number of pipes and rolled steel during repair. It is quite obvious that the machine builders must use materials with increased anticorrosion resistance in them to reduce the consumption of rolled metal of ferrous and nonferrous materials over the entire service life of the cars.

Improvement of Organization and Increasing Labor Efficiency

The main repair administrations and collectives of plants and planning and design offices are adopting urgent measures for technical re-equipping of the plant base of MPS and for increasing operational efficiency. However, it is impossible to solve this problem through measures of a technical nature alone. At the same time organization of production must be improved continuously, taking into account that an increase of labor productivity is largely affected by improvement of its normalization, introduction of brigade methods of

work and payment for the final results of labor and reduction of losses of working time. Correctly postulated normalization of labor presumes the mass use of equipment of substantiated time norms. In this regard we have posed the task of raising the specific weight of technically substantiated norms by 1985 an average of not less than 75 percent for all plants.

Elimination of non-productive losses of working time requires decisive strengthening of labor discipline with simultaneous improvement of organization of labor. One of the powerful levers here is the brigade form of organization of labor with payment for its final results. The experience of the Kaluga Turbine Plant, the Kanash Rail Car Repair Plant and a number of other enterprises of MPS shows that this method yields an important economic and social effect. More than 9,400 brigades, of which 7,500 are in main shops and approximately 1,900 are in auxiliary shops, have now been organized at plants of the Main Administration. The total scope of workers with brigade forms of labor exceeds 45.6 percent. It is planned to bring this indicator up to 60 percent during the 11th Five-Year Plan.

One of the most important national economic problems--to increase production efficiency--means an increase of the output of products from each repair position and from each unit of basic production funds under conditions of repair plants, more complete utilization of equipment, an increase of the shift factor and an increase of return of investments. The significance of the last indicator is very great. For example, an increase of the return of investment by only 1 kopeck is equivalent to an increase of products as a whole by 11 million rubles annually throughout the Main Administration. Improving the use of basic production funds at plants is related directly to expansion of the work front on reconstruction.

Nevertheless, the return of investment decreased by 3.5 percent as a whole throughout the Main Administration during the 10th Five-Year Plan and almost half the plants had a worse figure for this indicator. In this regard the Main Administration obligated the managers of plants that permit a reduction of the level of return of investment to analyze in detail within the shortest time the load of all their equipment and to adopt effective measures to increase the output of a product per unit of basic production funds. This will permit more complete provision of the needs of the railroads for repair of rolling stock, spare parts and other products.

An important problem on which intensification of production is directly dependent is to increase the shift operation of shops and equipment. The shift factor is rather high at the Novosibirsk Switch Plant, the Stryy, Panyutino, Lyublino and some other plants and usually reaches 2, whereas work goes on in three shifts at some limiting shops. However, many plants still operate with a shift factor not much exceeding 1. This indicates that large reserves for increasing the production of products without additional capital investments are hidden here. It has been calculated that organization of work for a second shift, for example, at one rail car repair plant alone, will yield a saving of capital investments in main production of approximately two million rubles.

True, the rates of construction of housing must be increased for these purposes to achieve the capability of housing two full shifts. The Main Administration has worked out a program for solving the corresponding social problems and primarily construction of dormitories of the hotel type for young workers, houses for small families and also children's institutions. However, implementation of it is being delayed by the restriction of funds and capabilities of construction organizations. Therefore, construction of social-cultural-service facilities through their own efforts has been organized at the Ulan-Ude, Krasnoyarsk, Daugavpils and some other plants.

One of the main directions of development of the socialist economy that guarantees an increase of social production efficiency, as was indicated in the decisions of the 26th CPSU Congress, is an increase of the quality of products produced. An increase in the quality of repair of rolling stock is of especially important significance for railroad workers since it is related directly to a guarantee of train traffic safety. Therefore, the quality of repair of rolling stock is constantly at the center of attention of plant collectives. Being guided by the decree of the CPSU Central Committee on the work experience of enterprises of L'vovskaya Oblast in development and introduction of a complex product quality control system (KSUPK) and by the decision of the board of MPS on dissemination of this leading experience, the plants are completing introduction of the elements of the system.

The system had a beneficial effect on an increase in the quality of repair and of other products at the phases of introduction. For example, the percentage of rejection was reduced by a factor of 3.2 at the Ulan-Ude plant during the first years of effect of KSUKP. More than 90 percent of the products are turned over on first presentation at the Daugavpils, Smela and Moscow Locomotive Repair Plant and a number of other plants. Many workers at the plants receive personal stamps and had the right to turn over articles without presenting them to the OTK [Technical control department].

At the same time, unfortunately, the situation with the quality of repair improved very insignificantly at plants in 1981. Cases of emergencies on the line, fires of rail cars and uncoupling of them from trains were also permitted through the fault of the plants. The number of claims, especially against traction rolling stock, was impermissibly high. The insufficient quality of repair of rolling stock is usually the result of weakening of control over observance of production discipline on the part of the production services of plants, shop chiefs, foremen and workers of OTK and also poor work in further improvement of the complex system of product quality control.

Giving primary significance to this problem, the Main Administration is conducting planned work at the plants to intensify control over negligent observance of technical requirements on products produced and a guarantee of the proper quality of repair of hardware. All managers of plants have been steered toward the need to guarantee clear execution of the orders of MPS on problems of increasing train traffic safety.

Efficient Use of Resources

Economizing of all types of resources and production is the most important national economic task. Both the Main Administration and all plants are involved with solution of it daily. A detailed program for economizing of labor, fuel and energy, financial and material resources have been developed at each of the enterprises. The main task here is to make more products from the allocated resources.

This is primarily related to production of spare parts for rolling stock. The technicians of the plants and PKTB of the Main Administration, together with scientists of scientific research institutes, are doing much to develop and introduce essentially new production processes and design solutions. For example, the piston for type D100 diesels of new design, developed by scientists of VNIIZhT jointly with workers of the Lyublino Plant and specialists of the Main Administration, has 1.5-fold greater durability. This means that a very important problem has been solved--the efficiency of pistons between major overhauls has been guaranteed.

Promising work in hardening the faces of the sleeves of the working cylinders of type D100 diesels using a laser is being conducted at the Poltava Plant together with specialists of the Institute of Welding imeni Paton. Preparation to produce piston rings from high-strength cast iron is being completed at the Orenburg Plant. The indicated work is directed primarily toward increasing the reliability and durability of the crank-piston group of type D100 diesels. A significant increase of the service life of these parts will in the final analysis permit total satisfaction of the needs for them and at the same time will sharply reduce the consumption of expensive high-alloy cast iron.

Modernization of the traction reducers is being carried out at all plants that repair 2TE10 diesel locomotives. In this case the rigid gear drive is replaced by a flexible drive developed by designers of the Voroshilovgrad Diesel Locomotive Plant together with workers of VNITI [All-Union Scientific Research Diesel Locomotive Institute]. This modernization more than cuts in half the wear of the teeth of the traction reducer. At the same time, the operation of traction electric motors is improved considerably by reduction of vibration.

Development of a technique for restoring worn axle-box journals of locomotive and rail car axles, fit seats for the bearings of roller axle boxes of rail cars and threads on the ends of rail car axles. Preparation to convert to washer attachment of the inner races of roller axle-box bearings for rail cars instead of threaded attachment is being completed this year at all rail car repair plants to reduce the rejection of axles due to wear of the threads. A technique for removing the centers of locomotive wheel pairs by the method of induction heating of the center instead of pressing them out has been developed and tested, which completely eliminates scratching of the axles. A new design of shafts of the spring suspension of diesel locomotives has been developed which serves from one plant repair to another without lubrication.

Much attention is being devoted to economizing of metal in manufacture of car retarders, switch settings and other machine building products. The workers of

the Main Administration, together with the collective of the rolling mill of the Dneprospetsstal' Plant, has developed a new profile of rolling the brake shoe of the car retarder. A new design of switch setting with continuous rolling surface has been developed, manufactured and is undergoing tests jointly with specialists of PKB [Planning and Design Office] of the Main Administration of Track, MPS, and scientists of VNIIZhT; the service life of the core of its frog has been increased approximately threefold. All switch settings are manufactured with hardened ends. A chamber for preliminary strengthening of cores of frogs by the explosion method has been put into operation, special rolling for manufacture of switch settings has been developed and so on.

Plants, design offices and institutes are conducting work to reduce the consumption of locomotive and rail car brake shoes. Locomotive and rail car brake shoes whose service life is 2-4-fold greater than standard shoes have been manufactured and are undergoing tests jointly with the Institute of Problems of Casting, Ukrainian SSR Academy of Sciences, and VNIIZhT. There is the capability of converting to manufacture of new shoes in 1983, which will permit a saving of no less than 20,000 tons of cast iron and approximately 1,000 tons of coke.

Calculations show that the planned measures as a whole will permit an annual saving of no less than 50,000 tons of rolled ferrous metals during the 11th Five-Year Plan.

Special attention is being devoted to economizing of non-ferrous metals. Complex modernization of the traction engines of diesel locomotives is directed mainly toward increasing their service life and accordingly toward economizing of nonferrous metal. The complex of work performed during modernization permits an increase of the service life of armature windings up to 25 percent. But this is still not the maximum. Replacement of PDA and PSD wires for PETVSD wires will also permit a significant increase of the service life of the armature winding. Work is being conducted to apply interturn insulation to the bare bus in the electrostatic field. Work whose purpose is to reduce the wear of collector plates both in diameter and in the width of the riser is of important significance. Successful completion of it will permit a significant increase of the service life of collectors and will reduce the consumption of valuable rolled copper.

Conversion of rail cars of the operational fleet to roller bearings also contributes to a reduction of the consumption of nonferrous metals and this yields a great saving not only of nonferrous casting but of power and also labor resources. A new technique for manufacture of radiator sections of the cooling system for diesel locomotives that provides tinning of only the tubes is being developed and introduced, which will save a significant amount of solder.

Repair of the parts of assemblies and units of locomotives and rail cars, especially massive parts, by the method of restoring worn surfaces is of important significance. Wide intorduction of this method on the one hand permits the service life of parts to be extended, i.e., to solve the problem of complete satisfaction of the needs for them, and on the other hand, to achieve a reduction of the consumption of many types of resources. This is primarily related

to restoration of drive shafts of all types of diesels, universal joint shafts and universal joint forks, piston rings, valves, spindles of spring suspension and so on to nominal or gradation dimensions. The use of working cylinder sleeves and pistons of the diesels of shunting locomotives and maintline diesels of type M62, manufactured by gradation dimensions, is also of interest. Restoration of worn surfaces of beams above springs and valences of carriages and also of other parts of passenger and freight cars such as axles and axle boxes, has been organized at rail car repair plants.

Along with traditional methods of restoring parts--universal build-up has been adopted in recent years to equip essentially new methods--plasma spring with special powders and welding of special alloy strips to friction surfaces with subsequent machining. The restored part serves longer than a new one in some cases. This is specifically true of the collars of valves, spindles and so on.

Wood is becoming an ever-scarcer material. Modernization of all gondolas with replacement of wood sheathing by metal sheathing, which it is planned to complete by 1983, will contribute to economizing of it. Similar modernization of boxcars has begun. At the same time measures are being conducted at plants on efficient use of wood. Gluing of board trim, especially for sheathing boxcars, has been organized and much attention is being devoted to careful selection and use of boards removed during disassembly of rail cars for repair. Only old timber is used for sealing sheathing and many of these materials are used during major overhaul of passenger cars.

Problems of economizing of production fuel and oils and electric power have acquired special significance recently. According to existing technology, after repair diesels are run for up to 20 hours at test stations. Reduction of this time and organization of recuperation and the electric power generated during tests are significant factors for economizing of diesel fuel and oil.

In this regard tests are being conducted at the Dnepropetrovsk Diesel Locomotive Repair Plant and the Poltava Plant jointly with KhIIT [Khar'kov Institute of Railroad Transportation Engineers imeni S. M. Kirov] to reduce the time of testing diesels after repair. Special additives are used in this case which permit this running-in of all contiguous surfaces of the diesel to be reached within 2-4 hours, the same as within 16-20 hours of ordinary operation. The test stations at all plants are being equipped with recovery installations which permit a significant reduction of the consumption of energy resources. Thus, 2.4 million kW·hr of electric power is fed annually into the system and is consumed inside the plant by test stations at the Poltava Plant, which comprises 6.7 percent of overall consumption (without the electric furnaces of the foundry). On the whole 42.1 million kW·hr of electric power and 38,000 tons of comparison fuel were saved at plants of the MPS during 1980, which comprises 3.5 and 2.9 percent of total consumption, respectively.

A very important factor for economizing of material resources is improvement of planning of material supply. It should be recognized that there are considerable disadvantages in this regard and that large above-norm reserves of different materials are frequently contained at plants. Individual plants of the Main Administration permit a constant exaggeration of orders, especially

for rolled ferrous metals, pipe, some nonferrous metals and electric insulating materials, without regard to the actual need for them for the volume of work being performed. As a result, for example, the Kanash Plant in 1980 transferred more than 380 tons of rolled ferrous metals, more than 80 tons of welding electrodes and so on to enterprises and organizations of other ministries and agencies. The Panyutino, Darnitskiy, Stryy, L'vov, Ivano-Frankovo and other plants released scarce materials to outside organizations.

Plant managers are frequently forced to turn over funded materials in exchange for other materials or complete articles. After all, in 1981 plants of MPS were allocated only 60 percent of the need for impregnating varnishes, 30 percent of enamels, 88 percent of locomotive tread bands, 77 percent of solid wheels and 39 percent of large-diameter installation wires.

The situation when new rail cars are actually constructed instead of major overhaul at repair plants cannot be recognized as normal. After all, everything in the rail car is replaced with this type of repair, besides the outside sheathing of the body. At the same time the rail car released from repair is frequently at the technical level of the 1940s-1950s, since many of the materials received by the plants are obsolete. Specifically, our plants do not receive the required number of plastics for internal finishing of passenger cars. We feel that the norms of consumption and the nomenclature of facing materials and also installation wires and pipes, especially of the heating system, should be the same as for newly constructed cars for those cars undergoing major overhaul. Only in this case can a rail car be restored according to modern requirements.

Capital Construction and Use of Capacities

Further development of the repair base of MPS is planned during the 11th Five-Year Plan. Expansion and reconstruction of 24 plants, begun during the 10th Five-Year Plan should be completed during the period 1981-1985. Because of this, additional plant capacities will be introduced for repair of locomotives, freight and passenger cars, electric machines and also for production of spare parts, switch settings, containers and car retarders.

Along with expansion and reconstruction of plants, measures are being adopted to increase the production capacities for repair of rolling stock and production of spare parts by additional use of internal reserves and intensification of production. Special attention is being devoted to guaranteeing the most rapid introduction and assimilation of production capacities already introduced. A special program has also been developed and the deadlines for assimilation of capacities have been established at the Voronezh, Ussuriy, Orenburg, Alma-Ata, L'vov, Krasnoyarsk and Tbilisi Locomotive Repair Plants and the Roslavl', Voronezh, Stryy and Yaroslavl' Rail Car Repair Plants.

The deficiences in capital construction noted at the 26th CPSU Congress also occur at plants of MPS. Despite the fact that the volumes of assimilation of capital investments and construction-installation work are increasing continuously, the plans of capital construction are not being fulfilled as a whole. During the 10th Five-Year Plan, the plants assimilated 172.7 million rubles

more than during the previous five-year plan. However, the capital construction plan was fulfilled by only 82.6 percent and the plan for construction and installation work was fulfilled by 76.2 percent.

An increase of production capacities for repair of 860 sections of diesel locomotives, 50 electric locomotives, 67 refrigerator sections, 13,320 freight cars, 560 all-metal passenger cars, 155 sections of electric trains, 15,000 containers, 2,000 sets of switch settings and for production of 15,000 steel castings was achieved due to capital construction during the 10th Five-Year Plan. At the same time, introduction of capacities for repair of electric machines was not guaranteed at the Voronezh Diesel Locomotive Repair Plant, of refrigerator sections at the Voronezh' Diesel Locomotive Repair Plant, of gondolas and the Yaroslavl' Rail Car Repair Plant, of freight cars at the Stryy, Roslavl' and Panyutino Plants, and of 15,000 containers at the Gryazi-Orlov Plant was not provided due to unsatisfactory work of the contract organizations of Mintransstroy.

Development of construction and installation work on construction of production facilities must be increased during the 11th Five-Year Plan. Expansion of practically all plants begun up to 1981 should mainly be completed in this case and work at a number of other facilities should be organized.

The plants put 155,000 m^2 of housing into operation in 1980, which is 1.5 times more than the annual introduction of apartment buildings achieved previously. At the same time, introduction of almost 12,000 m^2 of housing was interrupted at the Astrakhan, Chita and Gryzi-Orlov Plants.

Practice showed that difficulties with capital construction begin at the stages of supporting it with technical documentation and estimates and organization of the work front. The measures developed jointly with contract organizations annually and confirmed by the management of both ministries are frequently interrupted through the fault of the builders. Not everything is favorable with assimilation of funds allocated for acquirement of equipment. In some cases the equipment received by a plant has not been assembled and is not installed. A total of 17 million rubles was underassimilated in 1980 alone as a result of this negligent attitude toward development of production. The plan for manufacture of unstandardized equipment was not fulfilled by 12 of 17 plants, including such large plants as the Daugavpils and Voronezh Locomotive Repair Plants and the Michurinsk, Kaluga and Roslavl' Plants.

The insufficient level of utilization of production capacities at some plants is explained in most cases by the low rates of development of introduced capacities. For example, the Orenburg plant developed capacities for repair of diesel locomotives, introduced in 1977, by only 30 percent, and the Tashkent plant developed capacities by 67.7 percent. The level of utilziation of production capacities is directly dependent on the use of the areas of the main shops producing commercial products, on removal of a product from a unit are or from a single repair position for plants that repair rolling stock. The Main Administration as a whole achieved definite success in this regard during the 10th Five-Year Plan. However, the level of utilization of production capacities is still rather low at some plants. The task of the managers

of these plants is included in achieving the level of utilization of production areas as leading enterprises, universally using their experience, and of increasing the release of rolling stock from repair due to this.

Reduction of the length of the repair cycle and reduction of the idle time of rolling stock in repair is of important significance to improve the use of production areas. However, no appreciable improvement in this problem has been achieved during the past few years. The plants are not fulfilling the norm of idle time for dry-cargo freight cars and the situation is better with regard to passenger cars: the norm of their idle time is being fulfilled on the average for all plants, except the Ulan-Ude and Voronezh plants. Reduction of the length of repair of rolling stock is an important factor for increasing production efficiency and a large reserve for increasing the output of products. The plants should intensify their attention to this indicator and should guarantee unconditional fulfillment of it.

The range of problems faced by the transport industry during the 11th Five-Year Plan is diverse and vast. Successful solution of them requires intensive creative work in all sections, at all enterprises and at all job sites, strengthening of technological and production discipline and increasing the mutual exactingness and responsibility. The general efforts of the workers of our sector should be directed toward achieving the main goal--fully meeting the needs of transport for high-qulaity repair products, meeting the needs of the country for shipments of national economic goods and passengers and unconditional fulfillment of the decisions of the 26th Party Congress and the November (1981) Plenary Session of the CPSU Central Committee.

6521
CSO: 1829/254

MOSCOW TRANSPORTATION PLANS OUTLINED

Moscow GUDOK in Russian 8 Jun 82 p 2

[Text] These plans are based on the socialist obligations of Moscow transport builders, Moscow highway collectives, Moscow October division, and "Mosgiprotrans" planners:

--Complete construction of the third major Moscow-Biryulevo line. This will make it possible to increase the number of suburban trains by 30 percent.

--Ensure that the start-up complex, including maintenance and operation depot for the Moscow-Kursk passenger line are put into operation ahead of plan in the 4th quarter, as well as to develop the track route in the south gorge.

--Complete ahead of schedule by Builder's Day, a railroad extension line to the Aprelevka depot for the routine maintenance department.

--By 7 November, one and a half months ahead of schedule, begin operations at the train car start-up complex at Kyrovskaya station.

--In December, 1 year ahead of scheduled date, build and put into use no less than 20,000 square meters of living space.

--By 20 September, complete construction of the third major line in the Moscow-Kryukovo district.

9875
CSO: 1829/250

ROLLING STOCK FIGURES GIVEN, MISSING CARS NOTED

Moscow GUDOK in Russian 10 Jun 82 p 2

[Reader letters: "On the 'Orphan' Cars"]

[Text] Each day, 135,000 railroad cars belonging to various enterprises and organizations and another 17,000 leased cars move over the nation's railroads. They carry out great transport work.

However, the mail of GUDOK shows that the railroad workers do not everywhere show the same attitude toward the "foreign" cars as they do to their own and are not always concerned for their efficient use.

Such an attitude toward the rolling stock cannot be tolerated. A railroad car, regardless of to whom it belongs, requires respect and a proper approach. The letters published below deal with this.

Missing in Action; by I. Mos'pan, Volunteer Inspector from the Rayon People's Control Committee in Biysk

According to the rules, the railroad workers at a certain time should return railroad cars belonging to enterprises to the "registration" point. They should but they do not do this. For 5 years, the Biysk Chemical Combine has been looking for car No 4009 which belongs to it. It was dispatched on 30 September 1977 to Tashkent and has not been seen since. In April of the year before last, car No 642327 left for Yuzhnorechensk and also dropped out of sight. The same befell car No 222545 which was dispatched in October of the year before last to the station of Balakleva. Car No 222544 is missing in the same area of Balakleya. Since April of last year, we have been looking for it but cannot find it.

Where haven't the workers of the combine looked! If all the railroad addresses were listed there would not be enough room in the newspaper. There have been heaps of paper and stamps. But the answer has always been the same: the cars could not be found and that was it. We cannot understand why then the railroad workers regularly conduct car censuses which can be unilateral, bilateral or nationwide.... In these censuses is it really so difficult for the naked eye to spot a "foreign" car? It is clearly inscribed on it: "Combine property. To be returned."

A Common Concern; by O. Yakhontov, Mechanic at the Dump Train at the Bryansk Unified Railroad System

Railroad cars, to whomever they belong, serve one common cause of transporting freight needed by the national economy. Why then isn't the rolling stock which belongs to the enterprises considered an equal member in the enormous "family" of railroad cars? In any event the circuit trains which supply gravel to the enterprises in Bryanskaya Oblast are constantly ending up in the role of orphans.

Let me give examples. With other conditions being equal, as a rule a consist belonging to the MPS [Ministry of Railroads] follows the shortest and most advantageous route. It is loaded out of turn in the quarries and the circuit trains which are owned by the enterprises may stand idle for days.

At the stations of Pyatovskaya, Sukhodol and Obidimo of the Moscow Railroad, the traffic controllers generally do not consider giving each train its proper turn. This creates a difficult situation and it was necessary to divert co-workers from the Kaluzhskaya and Tul'skaya CPSU obkoms from their job in order for them to straighten things out.

Our circuit trains are used for supplying materials for state construction organizations. What sense does it make to strengthen some sections while weakening others? Doesn't the common concern benefit if the circuit trains are turned around more quickly? Undoubtedly it does. But for this a mere "trifle" is essential, namely that the railway workers consider our cars as the equal of state property.

The Search is Continuing; by O. Nedzvetskiy, Head of the Volunteer Section for Transportation and Communications at the Severodvinsk City People's Control Committee

The people's controllers of Severodvinsk have checked how the rolling stock is being used on the spurs of the city enterprises and at the station itself. Amazing things have been turned up. Particularly with cars belonging to enterprises. The railroad workers deal with them extremely arbitrarily: if they wish they are left on a siding or if they wish they may be moved miles away.

For example, take the platform car No 421528 which belongs to the construction workers. On 27 October of last year it was dispatched for repair to Isakogorka Station. It was repaired, it must be said quickly. But instead of being returned to Severodvinsk it was for some reason sent to Obozerskaya, although the return documents had been carefully drawn up for the car.

Obozerskaya Station "shoved" the platform car into the first train passing by. As it turned out, this was traveling to Mud'yuga. The railroad workers there quickly discovered the foreign car and returned it to Isakogorka. But here, after all of this, it was still not sent to its destination.

To put it briefly, the platform car ended up in Arkhangel'sk. There it was quickly loaded with containers and dispatched to Ivanovo. Later on, it went to Zagorsk, to Pavlovo-Posad, Noginsk and back to Pavlovo-Posad.... Here its trail was lost. The freight service of the Northern Railroad has carefully notified the owner: "The investigation is continuing but as yet there is no positive result."

The search for two gondolas with the numbers 637404 and 636894 has likewise not brought any "positive result." They left on 16 March for Matkosel'ka Station with a load of marble chips and have totally disappeared. Disappearing equally without a trace was platform car No 421470 which was sent to Zelenogorsk for reinforced concrete slabs in the middle of December last year.

10272
CSO: 1829/249

DEFECTIVE PARTS SENT TO SIBERIAN RAILROAD

Moscow GUDOK in Russian 16 Jun 82 p 2

[Article by N. Volkov, chief of the railroad electrical equipment laboratory, and L. Panfil', chief of the service for electrification and fuel and power management, candidate of engineering sciences, both of Novosibirsk: "The Price of Arbitrary Decisions"]

[Text] The power specialists of the West Siberian Railroad have acquired sound experience in excellent servicing of the overhead lines and have trained qualified personnel for this purpose. In short, much has been done, but we cannot say that the reliability of electric power supply is all of 100 percent guaranteed. We are well aware of our own defects, and we can correct them. We are more disturbed by something else--the reliability of certain components of the traction power supply network, which does not depend at all on those maintaining the overhead system.

Last year the builders put into service a new section, which made it possible to open up through movement of trains by electric traction over the entire central Siberian run. Every collective goes through a difficult period when it is first formed. But in a year more than 30 separate cases of defects have been recorded here, which applied to the department as a whole increased the number of defects 27 percent over the previous year. The causes were quickly analyzed: substandard products from the Orenburg Diesel Locomotive Repair Plant were used in large numbers in the section.

The technology for casting the dropper wire clamp was changed at the enterprise without clearance with the customer and, as it later turned out, without permission of the plant chief engineer and developers of that part. Part KS-046, as the clamp is called, had large internal cracks and split, unable to withstand the loads. The dropper wire hung below the trolley wire. When the electric locomotive passed, the dropper wire became wrapped around the current-receiving device--and the latter, in breaking, tore the overhead line system. An interruption in train traffic was inevitable.

The situation was further compounded by the fact that personnel for maintaining the traction power supply network are incomparably more dispersed on the new section than on old ones. This means that it also takes longer to repair failures. We also had our own complications: the low skill level of young

fitters, the shortage of personnel--after all, this was the period when crews were being formed.

An urgent effort was made to protect the defective parts with loops. But since it is difficult to guess which clamp at which point will be the next to fail, personnel for maintaining the traction power supply line had to install more than 27 protective loops in a short time.

At the same time telegrams and follow-up letters were being sent to the plant, but without results. Only after the plant chief engineer intervened did new parts arrive in place of the defective ones, and the flow of defective products from Orenburg was halted.

It has been the same story with another clamp, the KS-055, manufactured at the same enterprise. This time the method of fastening on the copper cable was arbitrarily changed in Orenburg. When the troubles began with this part on the line, we called upon the railroad transportation engineers at the Novosibirsk Institute to test it. It turned out that the new design ceased to hold the conductor at half the load supported by the previous clamps. What is the point and who needs a modernization which has not been cleared with anyone and has not gone through tests?

One might cite many such examples for various parts in the traction power supply network. It is not a matter of quantity, but of the essence of the thing. It seems that the people at the plant do not attribute the proper importance to the quality of parts which are small in weight but which can cause many troubles in operation.

Perhaps it would be worthwhile in evaluating the quality of parts to use sample inspection, which is random and episodic, but the method of statistical inspection, which has recently become widespread at industrial enterprises, is used. In this case the number of parts received by the inspectors depends on the volume of output, which offers an objective and unambiguous percentage of defective parts in every lot.

The laboratory of the department for electrification and power management of the West Siberian Railroad, jointly with the Novosibirsk Electric Locomotive Repair Plant, under assignment of the respective main administrations of the Ministry of Railways checked the quality of parts at the traction power supply network manufactured in Novosibirsk in the 1978-1980 period. Large lots of parts were found to be 100-percent suitable according to an inspection method that still exists today. Statistical inspection of the same lots showed that the rejects were running 15 percent. And those percentages precisely corresponded to the true state of affairs at the enterprise.

Probably if we want the traction power supply network to operate reliably, we need special inspection of the quality of manufacture of parts at the plant. However high the percentage of defective products, inspection at the present time is the only way of improving the reliability of operative assemblies in the traction power supply network.

7045
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NEW BRANCH OF TURKSIB COMPLETED

Alma-Ata KAZAKHSTANSKAYA PRAVDA in Russian 10 Jun 82 p 1

[Article by V. Cherkizov, KazTag correspondent]

[Text] The "Kazakhtransstroi" [Kazakh Transportation and Construction] trust collective has finished laying the first portion of the nearly 200 kilometer-long Sayak-Aktogai railroad line ahead of schedule. Construction of the line will open the way to new mining riches of the republic. Following tradition, the brigade of V. Kushnir invited D. Asylbekov, a transport construction veteran, to inspect this section.

As a boy, Dzholgaspek [Asylbekov] looked on in wonder and fear as the first "Satan cart," as the steam locomotive was called then in the villages, passed along the legendary Turksib. Later, he would be laying steel tracks himself. Now his work is being continued by his son, who, as was done half a century ago, works on the same team with Russians, Byelorussians, Ukrainians and representatives of other nationalities.

People have rightly named the Turkestan-Siberian line "the road of friendship." It was built by delegates from all the brotherly republics of our country in order to turn the desert into a blooming, industrialized region. Turksib provided a powerful thrust toward development of industry in the republic: automobile plants in Alma-Ata; light industry in Semipalatinsk; non-ferrous metallurgy in Rudnyi Altay. Fully-developed agricultural concerns have also come into being.

Each five-year plan added a branch to the mighty "trunk" of the railroad line. The branches led to shafts under construction at Balkhash and Tekeli, and the mines of the third All-Union stoke-hole. One such "ray" came to Karatau, thus ensuring the more rapid development of the "fertility vitamin" industry. At present, approximately 90 percent of the overall Union phosphorus, 40 percent of feed phosphates, and many other mineral fertilizers are manufactured here.

From the beginning of this year, railroad workers transported over 200,000 tons of ore in excess of plan to chemical plants; this resulted in production of over 100 tons of "field" vitamins. As their contribution toward completion of the food supply program grows, transportation workers transport thousands of tons of phosphorites on a daily basis.

Skillfully operating the powerful ballasting machines and road-layers, the builders are rapidly overcoming the sands and marshes that separate them from their goal. The friendship railroad line maintains an active work schedule. Day and night, rolling-stocks with wheat, coal and automobiles manufactured in Kazakhstan, Yakut timber, and Siberian petroleum travel over it. Millions of tons of cargo are transported annually along the Turksib--one of the most important links in the nation's railroad network.

9875
CSO: 1829/250

BRIEFS

MINSK METRO STATION--A team of stonemasons and cutters from "Soyuzmetrospetsstroi," [Metro special construction union], led by the experienced team leader Valeriy Shumilo, has begun finishing work on the fifth (out of eight stations) station having priority in metropolitan Minsk. The station is located on Lenin square and will have direct connections to the train station. The lobby has dark grey granite, white and yellow-pink marble. Two years remain before the first run of the Minsk metro. On the basis of socialist obligations, the first trains should arrive by the 40th anniversary of the liberation of the hero-city Minsk, capital of Byelorussia. [Text] [Moscow GUDOK in Russian 12 Jun 82 p 4] 9875

RIGA DIESEL TRAINS--The 200th diesel train has recently left the gates of the Red Labor Banner train car plant in Riga. Thus, one more socialist obligation has been fulfilled in honor of the 60th USSR anniversary. Diesel trains from Riga, which have been granted the government's mark of excellence, are successfully operating on the tracks of our Motherland, transporting up to 140 million passengers annually. [Text] [Moscow GUDOK in Russian 12 Jun 82 p 4] 9875

MODERNIZATION OF VL80S LOCOMOTIVE--One of the basic methods of raising the transportation volume is to increase train weight. To achieve this goal on lines with alternating current, VL80S electric locomotives are being modernized. The development of the VL80S is based on the VL80T model issued earlier. "Modernization of the VL80S electric locomotive anticipates possible locomotive operation coupled with three and four sections," according to N. Vas'ko, head of the Electrical Planning Division of the All-Union scientific, research, design, construction and technological institute for electric locomotive construction. "Thus, it will be possible to operate two coupled electric locomotives from either engineering cabin." The modernized VL80S electric locomotive can be coupled with electric locomotives of previous issue. As a result of a more thorough utilization of power, there will be an improvement in the efficiency indices. Specific utilization of electrical energy will be decreased by 4.9 percent, while savings in connection with expenditures for repair and maintenance of the locomotive park will comprise approximately 13.4 percent. [Text] [Moscow GUDOK in Russian 10 Jun 82 p 2] 9875

TRANSSIBERIAN ELECTRIFICATION CONTINUES--Electrification of the Transsiberian main track is proceeding. Currently, operations are being carried out at the

136 km Voinovka-Vagai section. In a year's time, 4.5 million rubles must be implemented here. The SMP-237 collective has been maintaining its first place in the competition since the beginning of the year. Three runs from Voinovka to Bagadinka have already been carried out. Approximately 1,000 contact network trestles have been constructed. The builders are working rapidly and skillfully. Many of them are major experts in their field. The brigade of A. Timukov, for example, has worked on the Abakan-Taishet line. The brigade distinguished itself on the TransSib as well: it had already completed its semi-annual goal by opening day of the 19th Komsomol Congress. Work performances of collectives SMP-198, 280, 384--barely so for 38--are rising steadily. This is all very well, but the builders are being constrained by the suppliers. Four Glavpromstroi plants still owe approximately 1,000 trestles. The Mochishchenskii plant, for example, has not supplied a single of the 260 projected trestles. Such an attitude toward electrification of the TransSib is unacceptable. [Text] [Moscow GUDOK in Russian 15 Jun 82 p 2] 9875

BAM ELECTRIC LOCOMOTIVE TESTED--An operational test of the BL84 No 001 electric locomotive that was built for the Baykal-Amur Line was carried out on the North-Caucasus route. This test locomotive was designed and built by the All-Union, Scientific, Research, Design, Construction and Technological Institute for Electric Locomotive Construction in Novocherkassk. The first run was performed along the Bataisk-Ilovaiskaya route. The train weighed 5,200 tons, or 1,000 tons above the weight norm set for electric locomotives of the BL80k and BL80r series. The train was run at maximum speed limits through all of the districts. P. Shtepenko, chief designer of the VL84 electric locomotive project, has stated that defects and irregularities in individual details and units were discovered in the test locomotive and eliminated. The operation was supervised by A. Polumestnyi, a specialist with broad expertise. Significant assistance toward completion of the locomotive was provided by V. Teplov, the tester. Locomotive brigades have responded favorably not only to the hauling properties of this electric locomotive, but to the control systems as well. A large portion of these operations has been automated. One cannot help noting the helpful attitude of the maintenance depot collective in Bataysk, where the electric locomotive was readied for operation. The tests are over. The BL84 No 001 locomotive must now be put into operation on other tracks of the nation. [Text] [Moscow GUDOK in Russian 15 Jun 82 p 2] 9875

TECHNICAL INFORMATION CAR--Several thousand kilometers and more than 130 years separate the young BAM [Baykal-Amur Mainline] and the oldest railroad in the nation, the October. For the first time, upon a decision of the MPS [Ministry of Railroads] a technical propaganda car was sent to the BAM from another railroad with the honorable mission of providing sponsorship aid and sharing experience in organizing work in the area of scientific-technical information and propaganda with the NTI [scientific-technical information] workers of the Tynda and Urgal' divisions. We will be traveling 6 weeks. The car is equipped with radio, movie and TV equipment. There are a number of exhibits devoted to the development of rail transportation during the 11th Five-Year Plan, to the social and economic development of the collective of the October Railroad and to introducing advanced labor methods on our mainline as approved by the CPSU Central Committee. [V. Georgiyevskiy, Chief of the Technical Propaganda Car of the October Raioroad] [Text] [Moscow GUDOK in Russian 10 Jun 82 p 2] 10272

MOSCOW THIRD TRACK--Construction is underway on the third main track of the Moscow--Biryulevo section. Extensive work is underway at Kolomenskoye Station. Here they are putting up an addition to the electric central control post, a building for the automatic block system transformer substation and a compressor station for the pneumatic cleaning of switches. The track system of the station and the contact grid are being reconstructed. The construction-installation trains Nos 348 and 248 from the Mostransstroy [Moscow Transport Construction] Trust are laying new switchovers and are putting down supports and rigid ties. The installation of the contact grid is being carried out by a collective from the power installation train No 1 from the railroad construction trust of the Moscow Railroad. The construction workers are being helped by workers from the MPS-32 [? Track Equipment Station], the Moscow-Pavelets Power Section and the track, signal and communications sections. In the photo [not reproduced] the brigade of N. Krasheninnikov from the SMP-348 [Construction-Installation Train] is replacing a track section on one of the tracks of Kolomenskoye Station and this will become a component part of the future third main track. [Text] [Moscow GUDOK in Russian 8 Jun 82 p 2] 10272

CSO: 1829/249

TRANSPORT PRODUCTION SYSTEMS DURING 11TH FIVE-YEAR PLAN

Moscow MORSKOY FLOT in Russian No 5, May 82 pp 13-14

[Article by I. Grabarnik, State Planning, Design and Scientific Research Institute of Marine Transportation, USSR Ministry of the Maritime Fleet]

[Text] The distinguishing feature of plans for development of maritime transport during the 11th Five-Year Plan is the leading growth of finite national economic results compared to capital, material and labor expenditures. One of the methods of achieving this task has become a further increase of the quality of shipments both in coasting and in foreign navigation.

The qualitative aspects of the transport process is characterized primarily by an increase of the rates of delivery, the regularity and frequency of plying of transport equipment, guarantee of the continuity of transportation of cargo and its preservation, improvement of the conditions of preparing a product for shipment and observation of environmental protection requirements during shipment and handling of cargo.

Reducing the needs of transport for labor resources, specifically, by eliminating heavy manual labor in transshipping operations, is also of no less important national economic significance.

The indicated problems can be solved provided there is a fundamental change of the technology of cargo shipments due to introduction of progressive transport production systems into the shipping process such as container, packet, ferry and lighter systems.

In this case a transport production system (TTS) is understood as a complex of coordinated technical parameters of the container stock, pallets, ships and port transshipping complexes, interrelated with related types of transport and specialized for handling containers, packets, rail cars and lighters, and also the complex of production, economic, organizational and commercial-legal decisions (measures) that permit one to guarantee shipment of cargo on specific lines from the consigner to the consignee with maximum effect and the least labor expenditures.

Operation of new progressive hardware such as ship container carriers, roll-on-roll-off ships, bulk carriers, lighter carriers, ferries and specialized

transshipping complexes have changed the technology of handling cargoes in ports and the working conditions of ship crews, new requirements on maintenance of the fleet and creation of new navigable lines have occurred, the relationships between maritime and related types of transport have changed and so on.

During the 10th Five Year Plan, the transport fleet was supplemented with new specialized vessels: roll-on-roll-off ships of the "Magnitogorsk" and "Skul'ptor Konenkov" class, container carriers of the "Khudozhnik Sar'yan" and "Kapitan Sakharov" class, ferries of the "Geroi Shipki" class and lighter carriers of the "Yulius Fuchik" class.

By the end of the 1970s, the shipping companies were supported by 24 one-way lines (of which 11 were serviced by specialized ships) and 16 joint lines (7), and specialized ships operated on 8 of 32 conferential lines. Thus, 36 percent of the lines were serviced by specialized ships during the 10th Five-Year Plan, whereas the fraction of lines on which these ships operated was only 23.3 percent during the Ninth Five-Year Plan.

The fraction of the specialized fleet in support of cargo shipments on lines will increase even more during the 11th Five-Year Plan and should comprise 45-50 percent by 1985.

The sector will have at its disposal 50 container carriers, 64 roll-on-roll-off ships, 20 ferries and 3 ro-flow ships by 1986 for working on maritime lines. Moreover, lighter carriers of Soviet construction of the "Aleksey Kosygin" class will begin to come on line. The carrying capacity of container carriers will increase by 58.4 percent and the capacity of roll-on-roll-off ships will increase by 73.5 percent.

Supplementation of the fleet with such highly productive and expensive specialized ships raises the need to use them on stable highly efficient lines and directions with maximum reduction of the berthing time in ports. Effective functioning of transport production systems is impossible without strengthened piers, platforms for formation of ship lots of cargo, container terminals, container stock, trailers and roller trailers, organization of the corresponding technology of cargo operations and timely preparation of cargo documents.

Large capital investments were made during the 10th Five-Year Plan in construction of the fleets and development of the ports for accelerated introduction and development of cargo shipments by different transport production systems. Large transshipping complexes and container terminals have been put into operation at Il'ichevsk, Leningrad, Arkhangel'sk, Vostochnyy Port, Magadan and Petropavlovsk-Kamchatskiy Ports and the number of piers has been increased.

Significant capital investments in development of the material base of ports are economically feasible since the final results of the functioning of the system, especially during operation of expensive specialized ships, depends to a considerable degree on the carrying capacity and organization of work of the ports.

A number of complexes for handling specialized ships will be constructed and reconstructed during the 11th Five-Year Plan for accelerated handling of the specialized fleet in the ports.

Construction of these complexes and putting them into operation is going on in all basins. Further development of port production capacities will proceed in two directions: improvement and reconstruction of the general-purpose pier front at existing ports and construction of new ports and port regions with specialized highly productive transshipping complexes (Vostochnyy Port in the Far East, Yuzhnyy Port on the Black Sea and so on).

Organization of cargo shipments on roll-on-roll-off ships will achieve further development, which will permit greater intensity of cargo operations and better use of the transshipping equipment and piers of ports.

Growth of Number of Lines on Which Specialized Ships are Used (in Percent)

1975	1980	1985
23.3	36	up to 50

Growth of Ferry Shipments (in Percent)

1975	1980	1985
100	145	217

Growth of Number of Large-Capacity Containers (in Percent)

Type of Transport	1980	1985
Maritime transport	75	85
Rail transport	19	25-30

The ferry system of cargo delivery is of special significance. This system of shipments is now being used in the Black Sea, Caspian and Far Eastern Basins.

The volume of shipments on ferries increased 1.45-fold in 1980 compared to 1975 and shipments of this transport production system will increase no less than 1.5-fold during the 11th Five-Year Plan.

Conversion to containerization of shipments of industrial production will continue on ever-increasing scales due to an increase of the stock of large-capacity containers. Development of container shipments is based on the successfully developed trade with France, West Germany, England, East Germany, Japan and the countries of Southeast Asia.

An important integral part of the transport system is the container stock. As shown by investigations, a promising standard dimension of a container for cargo shipment in the USSR is the large-capacity container of type IC (gross mass of 20 tons) of ISO [International Organization of Standards].

However, this type of container has not yet occupied its place in the total volumes of container shipments, especially on rail transport. Thus, whereas the specific weight of large-capacity containers in the total volume of container shipments comprised more than 75 percent in maritime transport in 1980, the volume was approximately 19 percent in rail transport; this fraction will change to 85 and 25-30 percent, respectively, in 1985.

Cargo shipments in containers developed at especially rapid rates between Japan and West European countries with transit through the USSR over the Trans-Siberian container line TSKL. Since the the end of 1980 parity has been established on this line between Soviet and Japanese ports in which four Soviet and four Japanese vessels transport and identical number of containers (1,690 units each of IC ISO).

The volume of cargo shipments in packets carried out by the fleet during the 10th Five-Year Plan increased more than 1.8-fold, including shipments of packaged lumber more than doubled. The volume of cargo shipments in packets will increase more than 1.5-fold during the 11th Five-Year Plan.

Specialized transport production systems should be used to the maximum in cargo shipments of Soviet foreign trade and in coasting. Special attention must be devoted in this case to problems of strengthening the organizational and material base of shipments.

Wide distribution of cargo shipments using different transport production systems in maritime transport is a guarantee for achieving the highest final results and successful solution of the tasks posed to the sector by the 26th CPSU Congress.

6521
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OPERATION UNDERWATER COMPLETED

Moscow MOSKOVSKAYA PRAVDA in Russian 23 May 82 p 3

[Article by A. Amirkhanyan]

[Text] Divers of the 4th expeditionary detachment "Podvodrechstroi" [Underwater Construction] performed a complex operation: They completed an underwater reconstruction of the dock in the Western port for the first time.

Two green flags went up above the divers' boat. The vessel stood at the very edge of the docking wall, and did not appear to be in the way of shipping traffic on Moskva river. But when the flags were raised, the barges that went by sharply reduced their speed and moved toward the center of the river. River sailors know that green flags indicate the start of underwater operations, and thus 50 square meters of the water area around the operation site must be free.

We came on board with K. Borisov, chief of the group. Aided by teammates, diver second class S. Khor'kov was already outfitted. It is impossible to get dressed alone since the gear is much too heavy. The shirt, a copper dickey, helmet, lead overshoes and special weights weigh approximately 100 kilograms. It's not easy to move on the deck in such a costume. Khor'kov attached a diver's knife to his side, checked the signal-hose once more. All was ready for the dive. A. Vidilin, the station foreman, gave the command to start the dive. Khor'kov walked slowly along the companion ladder into the water. A second or two and the copper helmet that shone in the sun disappeared underwater.

For a moment, except for the signal-hose that snaked into the water, everyone remained motionless. The cable stopped. From a depth of five meters, Khor'kov stated over the telephone he was ready to start the operation. In this instance, the back-up diver was the foreman himself. For several hours he maintained telephone contact between "ship and bottom." Along each section of the underwater path, Vidilin provided necessary instructions. "I've gone to the right, toward the wall...Am standing in a gully...Let's have the bags..." could be heard from time to time from the depths of the operation site.

We could hear Khor'kov's voice from the boat. And, based on how safety diver I. Karachev lowered or pulled up the signal-hose, or moved along the edge, one could determine where the underwater construction worker was located at a given moment.

As we stood on board, an operation unique in the conditions of our city was being performed at the bottom. Never before had underwater reconstruction of the capital's docks been performed.

Several years ago, in the course of routine examination of the docking wall of the West port, it was established that the underwater portion of the docks is in a critical state. These were built during the 2d Five-Year Plan. In the intervening years, ships that carry cargo into the capital--a five sea port--have become larger, sit more deeply in the water and have more powerful propellers. Steamships and barges have gradually washed away the soil under the bankheads; structures which made up the docking wall. At a distance of 185 meters, the bankheads were practically on the edge of an underwater "abyss." The danger of a slide and cracking in the wall appeared.

Using a "Giprorechtrans" design, the 4th detachment of "Podvodrechstroi" began operations to strengthen the wall. It was necessary to complete this operation during the five months non-navigation period. The divers of the detachment utilized underwater concreting methods. The concrete had to act as a secure seal in those areas where gullies had formed in the soil. A short time before the New Year, the relay brigades of Z. Ziodetdinov and A. Vidilin took the underwater duty in the Western port. More than one-hundred working days were required to complete reconstruction of the wall.

First, the divers meticulously studied the shape of the bottom in the region with gullies. They evened out the river bed with the aid of soil vacuums and water jets. Coupled reinforced concrete plates were placed at a right angle to the wall on the now even soil, right over the gullies. Then around each plate a mighty barrier composed of sacks filled with a concrete solution was constructed: a kind of unique planking was being constructed. It covered the gully in a semi-circle and separated it from the river. In such a manner, a new line of reinforced concrete wall was built, only one which stood at a sharp angle toward the old section of the dock. Concrete was poured into pipes between them.

"The divers laid 350 cubic meters of concrete and 88 plates. I think such strong seals will serve for many years," K. Borisov noted. "We will now conduct a similar operation at the end section of the port wall. As promised, the primary 185-meter section of the dock was ready in 10 days prior to the start of shipping activity."

As we spoke with the chief of the diving group, S. Khor'kov spent alomst two hours working at the bottom of Moskva river. As the diver worked he would step away from the wall and then return closer again. We could observe the trajectory of his motions by the air bubble tracks on the water. At a certain moment, the "tracks" began to move further and away from us.

"The primary assignment has been completed. Now the diver will examine the nearby sections where work will soon begin," the chief of S. Khor'kov's group explained.

Even a short list of the work performed by the river divers of the capital provides some idea of the significance of their work to the life of the city: metal welding and cutting, construction of water-barriers, laying underwater cables and pipes. The city is serviced by hundreds of hydrotechnical structures in industrial concerns, in recreation areas located near water reservoirs. All of these are in the domain of "Podvodrechstroi" experts. Not too long ago, when metro construction workers were building the tunnel for the Zhdanovsko-Krasnopresnenskaya line, the 4th expeditionary detachment performed a vital assignment: the divers froze the floor of the Moscow canal precisely at the spot where a branch of the metropolitan line was to pass.

Each time, when green flags are raised over a body of water, a countdown of underwater operations begins.

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IMPORTANCE OF WATER ARTERIES STRESSED

Moscow PRAVDA in Russian 8 Jun 82 p 1

[Editorial]

[Text] Take a look at the map of our Motherland: meandering blue lines cover large areas. The toiling rivers provide water for fields, move turbines in a hydroelectric station, and when the water arteries are used for navigation, they transport national economic cargoes.

With regard to the extent of internal navigation waterways, the Soviet Union occupies first place. These waterways transport cargoes over long distances with minimal expenditure of energy. The river transportation system of the Russian Federation alone transports over 40 million tons of crude oil and petroleum products, 17 million tons of coal, over 300 million tons of building materials, and approximately 5 million tons of grain.

It was noted at the 25th CPSU Congress that river transportation is continuously growing in importance. It is becoming one of the important components of the transportation system, the overall development program of which had been planned at the Congress. Specifically, there was a resolution to complete the building of a single deep water system within the European part of the country. Major operations will be conducted on the Volga-Baltic waterway, and the Belomorsko-Baltic canal. In the east of the country, the volume of transportation by water will rise to 160 million tons by 1985. In the current year, it will be necessary to transport 15 million tons of cargo more than what was shipped in 1981 to the Tyumen and Tomsk petroleum and gas producing regions. Transportation of grain, coal, cement, mineral fertilizers and construction materials will also increase.

The tasks that have been set before the transportation branch are broad and complicated. In order to successfully resolve them, it is necessary to: continuously strengthen the resource and technical foundation of the river transportation system; raise the potential of ports and docks; increase the size of the fleet; and lengthen navigation time along the principal waterways.

The resolution taken by the USSR CP Central Committee and the USSR Council of Ministers regarding "Measures for developing river transportation in 1981-1985 necessitates an active but responsible utilization of the waterways.

Specifically, it is necessary to transfer up to 40 million tons of cargo from train lines to river routes. This is a very important problem since the cost of transport over rivers in the European part of the country is one and a half times lower than transport by train.

The complete potential of river transport has not yet been fully utilized. In 1980-1981, only about eight million tons of cargo had been transferred from train to water transport. As on the navigable rivers, train personnel continue transporting petroleum products, grain, timber, coal, ore, and mineral fertilizer, in other words, everything that can be transported via the more economical waterways. The plan to implement train-water transport has been frustrated annually by subdivisions of the Ministry of Transportation. However, river personnel as well have allowed freight cars to be delayed over-schedule. As a result, at the beginning of the year, a lot of the cargo accumulated in the ports, having been delivered there in the preceeding navigation period. Such a situation is intolerable. The joint Gosplan USSR Committee for efficient transportation should emphatically forbid the ministries concerned to engage in inefficient transport, and to be more flexible in distributing the cargo among the various types of transports.

At times, cargo shippers and receivers have both held back development of water transportation. Certain ministries, Minzag USSR [Procurement Ministry], Minnefteprom [Petroleum Industry Ministry], Mingazprom [Gas Industry Ministry], and Minlesprom USSR [Timber Industry Ministry] are delaying the construction and implementation of docking facilities, and industrial warehouses, located near the navigable rivers: they also poorly supply the docks with necessary equipment and machinery. Without these, it is impossible to utilize the waterways in order to achieve a larger return.

In accordance with the "Basic Directions of Economic and Social Development in 1981-1985 and the Period Extending to 1990," the river fleet has added highly efficient vessels: powerful tugboats, barges and sectional units, dry-loading and petroleum-carrying steamships with a 5000 ton load capacity. For the first time, Volga river personnel have acquired "Volgo-Don" type steamships with barge-segments which can transport up to 11,000 tons of cargo. Powerful iceriggers allow river workers to significantly lengthen the duration of navigation, and in certain areas, even organize year-round fleet operations.

"River-ocean" type vessels have made it possible to significantly increase the volume of transportation and to broaden the geographic scope of mixed routes. Along such routes, transportation and delivery of cargoes without losses and unnecessary transfers from river basin to another is made possible, as well as to make ocean voyages. At present, however, the river workers do not have a sufficient number of such vessels. If the shipbuilders responded more fully to their requirements, it would be possible to transport significantly more cargo to the Ukraine and Moldavia without transfers from the central and north-west regions of RSFSR.

Currently, there is an acute lack of specialized vessels to carry automobiles, cement, mineral fertilizer, vegetables and fruits. However, based on the

plans for this year, one-third of the production of the "All-Russian Produce Garden"--the lower Volga area--must be transported to Moscow, Leningrad and other cities precisely by river transport. United Volga Shipping alone has to transport 20,000 tons of watermelons and tomatoes. In the Food Supply program approved by the May (1982) plenary session of the CPSU Central Committee it was noted that: "Delivery time for vegetables and melons from the Lower Volga regions to the industrial centers of the nation must be decreased. It is necessary to further develop docking facilities as well as that of fruit and vegetable centers located on the rivers."

Navigation activity of the second year of the Five-Year Plan is at its peak. River worker collectives are actively participating in the socialist competition to fulfill the decisions of the 26th CPSU Congress, in order to provide a worthy welcome of the 60-year anniversary of the formation of the USSR. It is a matter of honor for the water transport workers to successfully fulfill the planned quotas and the obligations they have undertaken. Party organizations in shipping organizations and ports, the communists among shipping personnel are being called upon to organize exemplary operations of the river transport conveyor units, and to deliver all cargoes, especially all agricultural cargo, to their destination without delay.

9875
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INCREASE IN NATION'S FOREIGN TRADE, MARITINE TRANSPORT

Moscow VODNYY TRANSPORT in Russian 11 May 82 p 2

[Article by Ye. Gekhtbart, engineer, meritorious worker of transport, RSFSR]

[Text] Foreign trade increased by 16.6 percent and comprised 109.7 billion rubles during the first year of the 11th Five-Year Plan. The high reputation of the USSR as a trading partner is well known. Last year 142 countries became trading partners of the USSR in foreign trade contacts. Ships of the Soviet commercial fleet gave a good recommendation for themselves from the best side in worldwide transport routes. They shipped many millions of tons of cargo by contracts of the USSR and the socialist, developing and capitalist countries and also in export of transportation services. Among all types of transport, maritime transport encompasses 47.9 percent to support the foreign trade of the USSR.

Last year more than half (52.8 percent) of the foreign trade of the USSR was with the socialist countries, including 47.8 percent to CEMA countries. The friendly relations between the USSR and Vietnam grow stronger from year to year. Fulfilling their international duty, the crews of ships from the Far Eastern, Primorskiy, Black Sea, Novorossisk and other shipping countries guarantee uninterrupted delivery of cargo to this country. The ports of Vladivostok, Nakhodka and Sakhalin render extensive assistance to dock workers of Vietnam in improvement of cargo operations and acceleration of ship handling.

The foreign trade of our country with the Republic of Cuba, which reached 8.1 billion rubles in 1981, is increasing continuously. Machinery, equipment, transportation equipment and also petroleum products are among the Soviet exports to the island of freedom. Potassium salts, ammonium sulfate, superphosphate, urea, cross-ties, lumber, industrial goods and foodstuffs are also delivered in considerable quantities. The main import to the USSR from Cuba is raw sugar. The Baltic, Black Sea, Novorossisk and Latvian Shipping Companies occupy the leading position in support of foreign trade goods between USSR ports and Cuba.

The international socialist competition between the crews of Soviet ships and the dock workers of Cuban and Vietnam ports and ports of other socialist countries has an important influence on acceleration of ship handling.

The collective of the Soviet Danube Shipping Line makes an important contribution to shipments of foreign trade goods between the ports of our country and the Danube countries--Czechoslovakia, Hungary, Yugoslavia and Bulgaria. Many goods are transported by Soviet shipping companies on the Baltic through transport ties with the GDR and Poland.

In 1980 the volume of foreign trade with the developing countries comprised 12 billion rubles and in 1981 it comprised 16.5 billion rubles. India, Argentina, Iraq, Iran, Afghanistan, Libya, Brazil, Syria, Egypt and Turkey are the largest trading partners of the USSR among developing countries. The USSR is attempting to build economic and scientific and technical cooperation with the developing countries on a basis advantageous to both sides. Ships of the Soviet commercial fleet transport millions of tons of cargo between our country and the ports of these countries. They have participated in delivery of equipment and cargo for the hydroengineering complex in Syria, the second unit of the metallurgical plant in Algeria and bauxite mining enterprises in Guinea.

Petroleum products, lumber, rolled ferrous metals, chemical and other goods were sold by the USSR to the developing countries in 1981. The maritime ships haul tea, spices, tropical fruits, grain, vegetable oils, raw minerals, fuel, machine building products and other goods in the opposite direction.

The foreign trade of the USSR with the industrially developed countries comprised 35.3 billion rubles in 1981 or 32.2 percent of the entire foreign trade volume. West Germany occupies first place among this group of states, followed by Finland, France, Italy and Japan. The economic ties of our country were developed most successfully with those capitalist countries which maintained a realistic course in questions of business contacts with the USSR, specifically West Germany, in 1980-1981 when the United States undertook well-known discriminatory actions directed toward interrupting trade with the Soviet Union. It was no accident during his visit to West Germany that Comrade L. I. Brezhnev emphasized: "Commerce between our countries will increase continuously and become more important."

Barter is beginning to take on ever greater significance when payment for delivered equipment for different enterprises is subsequently made in products from the constructed facilities. A contract was concluded in November of last year for the annual delivery of 10.5 billion cubic meters of natural gas from the USSR to West Germany. A Soviet-French contract signed in Paris in 1982 provides that France, beginning in 1984, will receive 8 billion cubic meters of gas annually. In this case the corresponding countries will deliver to our country pipe, pumping stations and equipment for the gas pipeline. These contracts have been called the transactions of the century in the world press.

Soviet foreign trade organizations have already included large long-term contracts with many companies of West Germany, Finland, France and Italy for mutual deliveries of various products during the 11th Five-Year Plan. Machinery and equipment, including complete sets for many starting facilities in ferrous and nonferrous metallurgy, the chemical, paper-pulp, timber, coal, gas and other sectors of industry, ships and ship equipment and large-diameter steel pipe will be delivered to our country.

Exports from the USSR reached a volume of 57.1 billion rubles in 1981. The specific weight of machinery, equipment and transportation equipment, most laborious for transport by the maritime fleet, comprised 13.7 percent--7.8 billion rubles.

In 1980, 32 countries exported petroleum products. The leading position among the industrially developed countries in purchases of these goods is occupied by France, Italy, West Germany, Finland, Great Britain and the Netherlands, and among the developing countries it is occupied by India. Last year the fraction of fuel and energy goods in USSR export increased somewhat compared to 1980.

The export of timber reached 13.9 compact cubic meters. The Northern, Baltic, Far Eastern, Sakhalin and other shipping companies have at their disposal a large timber-carrying fleet that guarantees delivery of these goods.

Imports to the USSR comprised 52.6 billion rubles in 1981. Of this sum, machinery, equipment and transportation equipment worth 15.9 billion rubles were imported to our country. The cost of ships and equipment delivered to the maritime, river and fishing fleets comprised 1.235 billion rubles.

Foreign trade plays an important role in supplementing the market funds of retail trade for fuller support of the consumer demand of the population. It is reported in a survey of USSR foreign trade, published in the April issue of EKONOMICHESKAYA GAZETA, that 4.2 million tons of raw sugar, 980,000 tons of meat and meat products, 215,000 tons of butter, 556 million eggs, 41,000 tons of coffee, 121,000 tons of cocoa beans, 84,000 tons of tea, 1.021 million tons of fresh fruits and berries and 213,000 tons of fresh vegetables were imported to our country last year. The seamen of the Soviet commerical fleet and the stevedores of the ports, in close cooperation with rail and other types of transport, are making an important contribution with their creative, selfless labor to successful solution of the foodstuff program, transporting, transshipping and dispatching these goods by designation.

Being developed according to a unified national economic plan, the USSR Maritime Fleet has more than 1,700 vessels with capacity from 1,000 to 150,000 tons in its composition as of the beinning of 1982. These are tankers, oil and ore carriers, container carriers, bulk carriers, timber carriers, refrigerator ships, a specialized fleet, marine rail ferries, gas carriers and other vessels. The total deadweight of the maritime fleet exceeds 18.5 million tons. Last year, ships under the flag of our country visited 1,155 ports of 124 countries.

Much attention is being devoted to the shore base of maritime transport. New transshipping complexes and terminals are being put into operation, the stock of transshipping equipment is being supplemented, new ports are being constructed, existing ports are being reconstructed, and large-scale socioeconomic problems of organization of labor, everyday life and recreation of the workers of maritime transport are being solved.

It is planned to increase the foreign trade of the USSR by 22.5 percent during this five-year plan compared to the 10th Five-Year Plan. The maritime shipping

companies take this into account in their long-term and operational plans and in plans for development of the fleet and port facilities, further expansion of the related work with related types of transport and foreign trade subdivisions with respect to continuous unified schedule plans.

Having begun the struggle to successfully implement the tasks advanced by the 26th CPSU Congress, the workers of maritime transport are doing everything so as to transport foreign trade goods on time and completely and to accelerate handling of ships and rail cars. They fully support the sequential course of the Soviet Union toward broad development of international economic cooperation in the interests of maintaining peace, deepening ties and mutual understanding between peoples and of further increasing the well-being of the Soviet people.

6521
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CAPABILITY OF RIVER WORKER AT SEA

Moscow MORSKOY FLOT in Russian No 5, May 82 pp 30-33

[Article by S. Bulgakov, captain of long-range navigation]

[Text] A qualitatively new type of shipment of national economic and export-import cargo began comparatively recently on mixed navigation (river-sea) ships. The appearance of an essentially new class of ships posed a number of problems of a legal nature to specialists. Part of these problems have already been solved successfully, while part are still begin studied. We would like to touch on one of these problems in this article, which at first glance is somewhat unexpected and unusual. In the deep conviction of the author, solution of it would contribute to a significant increase in the level of organization of cargo shipments in mixed communication, to an increase of the navigation safety of these ships and would also facilitate the working conditions of their crews.

Specialists having maritime and river working certificates simultaneously work on ships of this class due to the characteristic features of mixed navigation. Thus, for example, a large detachment of specialists in the Belomorsk-Onega Shipping Company has diplomas of captains of all groups of ships provided with agency documents of MRF [Ministry of the River Fleet], RSFSR, and diplomas of captains of long-range navigation according to the Regulations on the Ranks of Officer Personnel of Maritime Vessels.

How does one call these general-purpose specialists? From time to time one sees glaring headlines on the pages of our central newspapers, including "VODNYY TRANSPORT," of the type such as "River Workers in the Mediterranean Sea," "River Workers Have Gone to Sea" and so on. Once there also appeared the expression: "River Workers Near the Shores of Scandinavia"?!!

One must become accustomed to hearing that specialists working on ships of mixed navigation are scornfully and indifferently called "river worker" at maritime ports, while they are called "seaman" at river ports, also scornfully, but with some irony. The expression "mixed navigation"is also somewhat strange.

The essence of the question is of course not in a name. We see the problem as much deeper than this may appear at first glance. The fact is that the

legal position of a large detachment of ships of mixed navigation and their crews and the capability and legality of their adhering to and fulfilling the legal acts of the USSR in questions of sea navigation depends on how one approaches such a seemingly secondary concept as conformity of a term (service rather than everyday conformity) to work being performed. And this is a question which emerges beyond one or another agency desire in its social significance.

Ratification by our country of the International Convention on Training and Certification of Seamen and Maintaining Watch of 1978 provides the basis to confirm the impermissibility of any uncertain interpretation of such occupational concepts as "seamen" and "river worker."

Thus, the term "maritime vessel" is understood in the text of the convention as a "ship different than those which sail exclusively in internal waterways, within protected waters or in the immediate vicinity of them or in the spheres of influence of port regulations." Hence, it is obvious that a ship of mixed navigation, making voyages which are classified as long-range according to existing standard documents, fully corresponds to the term "maritime vessel" without any exceptions according to the definitions of the given convention. Moveover, a considerable part of vessels of mixed navigation is constructed under the observation of the USSR registry for its class. Thus, vessels of mixed navigation fully correspond in the volume of requirements placed on them to the concept "maritime vessel." Another question is then appropriate: who can operate these ships?

It is said in the Concise Dictionary of the Living Russian Language edited by V. I. Dal', published in 1907: "A seaman is one who serves in the fleet." There is no term and definition of the word "river worker." The following definitions are given in the Concise Dictionary of the Russian Language edited by D. N. Ushakov, published in 1938: "A seaman is one who serves in the fleet and a person experienced in maritime matters; a river worker is a worker of river transport." The meaning of the terms "seaman" and "river worker" is outlined in approximately the same edition in the Dictionary of the Russian Language edited by S. I. Ozhegov, published in 1972.

On the one hand, the crew member of a ship of mixed navigation, belonging let us say, to the MRF, RSFSR, is a worker of river transport. On the other hand, he is also a person experienced in maritime matters. No one will deny that receiving the diploma of a captain of long-range navigation or the diploma of an engineer, first rank, indicates the experience level of a specialist in "maritime matters." And it seems incompetent to us to apply the term "river worker" to the crew member of a ship of mixed navigation as a fucntion only of his agency affiliation. The term "river worker at sea" is competent and will correspond truly only in the case when a purely river vessel makes a one-time or experimental voyage to sea in view of some circumstances, i.e., it performs a task that is not part of its constant work.

The practice of using the term "river worker at sea" for crews of vessels of mixed navigation leads in official circles to consequences that have a negative effect on the degree and quality of guaranteeing the navigational safety of these vessels and on the efficiency of their operation.

The chief of the Main Maritime Inspection, MMF [Ministry of the Maritime Fleet] B. Naynagashev, notes with complete substantiation ("MORSKOY FLOT", No 12, 1980) that the "many centuries of human experience at sea has made it possible to set specific requirements and indisputable laws, being guided by which seamen guarantee navigational safety." These laws and requirements, enduring and perfected by many years of practice of Soviet and worldwide navigation, have found reflection in the normative documents of MMF, published to supplement and develop the USSR Codex of Commercial Navigation and other legal documents on questions of navigation. But since "river workers went to sea," the MRF, RSFSR, was forced to turn to publishing its own documents that regulate the navigational safety of ships of mixed navigation. In most cases these are consciously republished documents of MMF, only under a different heading. This is essentially not so important. What is impermissible is something else: a number of documents intended to regulate the operation of a vessel of mixed navigation at sea is developed on the basis of the experience and established traditions inherent to navigation under river conditions or of their conformity to the capabilities of the sector where this type of fleet is secondary in its significance. The clearest and most illuminated example of this "document" in the press is the regulation of maintaining navigator watches at sea on vessels of mixed navigation of MRF, RSFSR, the same as is done in navigation on the inland waterways of the RSFSR.

The question of the unacceptability of this document to the operating conditions of vessels of mixed navigation at sea has been raised repeatedly on the pages of "PRAVDA" and "VODNYY TRANSPORT," was brought before the management of MRF, RSFSR, the Central Trade-Union Committee of workers of the maritime and river fleet, was considered at a meeting of the board of MRF, RSFSR, in June 1981, but unfortunately has not gained a final solution. The narrow agency approach to this problem, in view of the established psychological traditions of river navigation that are difficult to overcome, is stronger than the many years of practice of Soviet navigation. This problem was also not reflected in the All-Union seminar held at Klaypeda in May 1981, where representatives of maritime and river agencies participated. The participants of the seminar were told in detail about the problems of the sea and river separately, but problems of the joining of the sea and river, i.e., a region of operation of ships of mixed navigation with their little studied characteristics and agency dispersion, were not touched on in a single one of the reports.

The following fact indicates the difficulty of overcoming the agency barrier. Transfers through regions of inland waterways are excluded from the qualifications for specialists working on vessels of mixed navigation of MRF, RSFSR, in the set of navigation qualifications to obtain a working maritime diploma during indirect voyages from one maritime port to another. This results in the fact that specialists cannot acquire the required navigation qualifications for decades on specific lines. The interested shipping companies of MRF, RSFSR, are forced to maintain an additional multiman staff of specialists of so-called "maritime qualification," i.e., those personnel who have the appropriate maritime diplomas at Leningrad, Belomorsk, Astrakhan', Rostov and other points to guarantee fulfillment of state tasks in shipment of cargo in mixed communication. They are "placed" on the ship upon departure to the

sea to supplement the permanent crew, although they frequently have no knowledge of the systems, devices, mechanisms or characteristics of the ships on which they are obligated to guarantee the safety of the maritime transfer.

The absurdity of this artificially created barrier is very obvious on examples of specialists of the engine room and electromechanical parts when, let us assume, a motor ship of mixed navigation is anchored at Belomorsk without the right to go to sea to transfer to Kandalaksha only because the electrical engineer or engineer who works permanently on this motor ship and knows perfectly its systems and mechanisms, does not have a working maritime diploma. "Authorization" to go to sea will be received only when a person with the appropriate diploma appears on board (but without any practical knowledge of its mechanisms). The formality of this approach to the matter is obvious--after all, enormous state funds are wasted.

An increase of the dimensions of vessels of mixed navigation, saturation of them with modern equipment, the guarantee of performing various international requirements, conversion to the navigator system of piloting and standardization of programs at academic institutions do not provide the right to leave questions of consideration of navigational qualifications in positions of 20 or 30 years ago. After all, no one can exclude from the navigation qualifications of specialists of MMF the time expended by ships on transition through inland waterways, let us say, during a voyage to Igarka or Dudnika. The time the ships are anchored in port up to a month is also not excluded from the navigational qualifications.

Then why, if a motor ship of mixed navigation completes the transfer through the inland waterways, where pilots receive good practice in maneuvering in narrow places, berthing operations and setup operations--anchor operations, entrance and exits from locks--instead of being at anchor in a maritime port for a whole month, while the engineers guarantee trouble-free operation of the machinery and mechanisms, then why cannot these specialists count this time among their navigation qualifications to obtain a working maritime diploma. How can one talk about specifics here when on the one hand, a month's anchorage in port is counted among the navigation qualifications and on the otherhand navigation during this period under complex navigation conditions of inland waterways is not counted. The paradox is obvious. And obviously if such a term as "river worker at sea" disappears from our service handling, this explicitly intended and tendentious measure also disappears.

One cannot help but dwell somewhat on another example that characterizes the desire toward a narrow agency approach in an important government matter such as organization of navigation in mixed communication is, in view of the incorrect use of terminology and, on this basis, erroneous interpretation of a number of normative documents.

The state inspection to guarantee navigation safety, disseminated to all ships in the ports regardless of their affiliation and flag, is entrusted to the maritime ports according to the USSR Codex of Commercial Navigation. The port captain performs his functions by checks of ship documents, diplomas and certification of ships by workers of the port inspection upon formulation

of ship arrival to the port, departure from the port and during anchorage in the port. This is a law by which the responsibility of the port captains for permitting ships to go to sea in complete accord with established rules and regulations determined by legislative acts of our country is determined.

However, MRF, RSFSR, on the basis of agency interests constructed on the concept "river worker at sea," creates its own instructions. Ships of mixed navigation, being in the water basin of the maritime port, i.e., under the jurisdiction of the powers of the port captain established by law, began to be inspected and rechecked as well by workers of the ship inspections of MRF, RSFSR, in addition to inspection by workers of the port inspection.

Conflicting aspects when the port inspection of MMF gives "authorization" to a ship of mixed navigation to go to sea, while a worker of the maritime inspections forbids it or places the capability of this departure under doubt, arise due to the not-quite-stipulated intrusion of one inspection organization into the sphere of influence of another. And the opposite also occurs. Moreover, this postulation of the question is in contradiction to the requirements of item 6 of the USSR KTM [Codex of Commercial Navigation], where it is directly stipulated that the state inspection over commercial navigation is performed by the MMF, the rules and requirements of which are obligatory for execution by the shipping companies and other organizations of MRF, RSFSR. This is also reflected in the moral and psychological status of the crew, subjected to absolutely unnecessary duplicate checks. Moreover, this results in unproductive idle times of ships and creates dangerous conflict situations prior to departure to sea, which is fraught with accidents.

The motor ship "Baltiyskiy-39" was recently placed on report in Kaliningrad by a worker of the local maritime inspection with the requirement of performing insignificant repair of the hull with subsequent notification of the USSR Registry. After the repair had been performed and the ship had been presented to the USSR Registry, a representative of the port inspection, which authorizes it to go to sea, inspects it. The captain departs on the voyage and transmits a radiogram from sea to the maritime inspector and the ship owner that all the requirements placed on him have been fulfilled and that he has received authorization from the port captain to depart. This has no effect on the workers of the maritime inspection. They require that the ship owner implement measures against an obstinate, they feel, captain. The fact of the attempt of the maritime inspection of MRF, RSFSR, to revise the work of the port captain and place execution of the service duty of the workers of port inspection of MMF under doubt, for which they have no right whatever, is obvious.

In their justification, the workers of the maritime inspections cite the Instructions on the procedure for guaranteeing the navigation safety of ships of MRF, RSFSR, verification of fulfillment of which is entrusted to them by an order of the Minister of the River Fleet. But the fact is that the named instruction determines only general regulations concerning organization of the guarantee of navigational safety of ships of MFR, RSFSR, at sea, but does not determine and cannot determine the procedure for inspection of ships of MRF, RSFSR, in commercial maritime ports, which as we already mentioned, is

determined by article 6, USSR KTM. The ship owner is right in checking his own ships during their anchorage at maritime ports in all directions, but according to item 5 of this instruction, the ship can sail only after formulation of authorization by the captain of the maritime commercial port. The instructions do not provide the right of the ship owner as well as to the worker of the maritime navigation to cancel the authorization of the port captain, who is acting on the basis of the law. It is obvious that clearer legal definitions and explanations are needed in this problem. And the initial cause is hidden in application of the term "river worker at sea," unjustly applied to circumstances with respect to ships of mixed navigation of MRF, RSFSR. Their activity is enclosed on the one hand by regulations of the USSR Codex of Commercial Navigation and on the other hand by agency instructions, which creates dual situations in the legal sense.

Analyzing the given examples, it is logical to ask the question that we posed at the beginning of the article: who is the crew member of a ship of mixed navigation? He has the passport of a seaman, the sanitary passport of a seaman, the diploma of a captain of long-range navigation and the diploma of the captain of all groups of ships of MRF, RSFSR. He freely determines the ship's position by the stars and navigates it in the narrow places of the Volga-Baltic Canal. He berths the ship in the harbors of Genoa and Naberezhnyye Chelny, Rotterdam and Akhtyubinsk. What is the correct name for such a specialist so that all his qualities are synthesized fully in one word?

Comments of the Chief Maritime Inspection, MMF

In the opinion of the Chief Maritime Inspection of MMF, S. Bulgakov is incorrect and here is why.

First, verification by captains of the maritime commercial ports prior to sailing of ships of mixed (river-sea) navigation belonging to different agencies does not exclude verification of them by owner representatives.

The worker of the port inspection usually determines the possibility of releasing the ship to depart according to ship documents and external inspection (draft, roll, trim, securing of deck cargo and so on). The owner representative may detect deficiencies that concern fulfillment of the requirements placed on these ships directly by the river agencies. They have the right to forbid departure of the ship on the voyage themselves or through the captain of the maritime port. The authority of the port captain suffers in no way in this case. On the contrary, he is being assisted (taking into account the small staff of the port inspections) and the navigation safety of ships at sea is enhanced.

Second, during navigation at sea under normal conditions, the captain does not have to stand watch since he bears 24-hour responsibility for the entire ship regardless of the rest time. The captain's work, including standing watch, is determined during navigation through inland navigable waterways by the by-laws of service on ships of internal navigation. It is important only that the captain have sufficient rest prior to sailing if he stands watch while under way.

Third, the question of consideration of navigation time in internal navigable waterways in navigation qualifications has already been repeatedly brought up by the Ministry of the River Fleet to MMF and was not supported since navigation at sea has considerable specifics for all personnel of the officers standing watch.

With regard to terminology, including everyday terminology (river worker or seaman), this is of no significant import.

Comments of Chief Inspection on Navigation Safety, MFR, RSFSR

Timely questions are touched on in S. Bulgakov's article: Organization of service on ships of mixed navigation, the procedure of gaining navigation qualifications by the officers for exchange of working diplomas and the related need to maintain "groups of navigation pilots," i.e., additional specialists with maritime working diplomas.

Actually, mixed navigation has become overgrown with normative documents in its scales that regulate this type of navigation. The officers should have two different working diplomas--maritime and river--and emergency cases in maritime waters are investigated and formalized by one regulation while those on inland navigable waterways are investigated and regulated by another and so on.

The Ministry of the Maritime Fleet has established the procedure for gaining navigation qualifications such that commanders should work for 10-13 years in navigation of ships of MRF to Makhachkala, Aktau and Kandalaksha (our regular lines) to obtain a working diploma that permits them to occupy the post of first mate or second engineer, whereas a navigator of the MMF can become a ship captain of unrestricted region of navigation within 7-8 years. Of course, this question should be solved especially now, when the Soviet Union has ratified the International Convention on Training and Certification of Seamen and Those Standing Watch for 1978, by which qualifications are considerably increased. The MMF and MRF are now working on a new regulation to certify seamen.

S. Bulgakov is also correct with regard to the fact that the river schedule of standing watch, coordinated with MMF as early as 1964, during navigation of a ship at sea (when mixed navigation was insignificant and carried out only in coastal regions) has not yet been reviewed, although a large number of ships now operate in long-range navigation. Reworking of the Bylaws of Service on ships of the Ministry of the River Fleet, RSFSR, is now being completed with regard to the characteristics of working at sea.

Stating that "workers of the maritime inspection are incompetent to carry out inspections of ships in maritime ports," S. Bulgakov is absolutely incorrect. Actually, the bylaws of inland water transport determine the functions of maritime inspection of both the verification organization with respect to ships of all ministries and agencies on inland navigable waterways. But since the maritime inspection is included in the structure of the Ministry

of the River Fleet, RSFSR, the Minister of the River Fleet has introduced in it specialists of maritime profile and has entrusted to it the right to "verify fulfillment by all subdivisions and crews of ships of MRF instructions on the procedure for guaranteeing the navigation safety of ships of MRF." The remaining part is well stated in the first item of the comments of GMI [Chief Maritime Inspection], MMF.

On the background of the truly important questions raised by S. Bulgakov in the article, it's hardly worth talking about terminology, even more so since this is everyday terminology. True, the term "ship officer of mixed navigation" is beginning to be common in service documentation.

6521
CSO: 1829/232

MODERNIZATION OF FLEET DURING 11TH FIVE-YEAR PLAN

Moscow MORSKOY FLOT in Russian No 5, May 82 pp 46-48

[Article by S. Kozlov and A. Klimenko]

[Text] A series of ships of the "Zoya Kosmodem'yanskaya" class with deadweight of 50,000 tons, designed to transport bulk cargo and ore, has been constructed in our country. The ships are being operated successfully by the Black Sea Shipping Company on long-range lines, where they transport large-diameter pipe in their holds and on the upper deck and large-size and heavy cargo in addition to specific cargo. The ships have high technical and economic indicators and the expenditures for construction of them were repaid considerably earlier than the planned deadline. The experience of operating these ships confirmed the correctness of selecting their basic characteristics: deadweight, load capacity, navigation range and speed. The bulk carriers have good navigability, stability, controllability and adaptability to cargo operations.

To guarantee the increased volumes of cargo shipments, a decision was made to continue construction of these ships in a modernized version during the 11th Five-Year Plan. While retaining the designation of the ship, its deadweight, main dimensions, power plant, navigation region and range, the modernized bulk carrier will satisfy all the regulations in effect on 1 June 1979, ratified by the international conventions and some national regulations.*

Like ships of a constructed series, the modernized bulk carrier will be a single-screw, single-deck motor ship of unlimited navigation range with short forecastle and stern placement of the engine room and superstructure. The class of the USSR registry is KM*LZA2 (bulk carrier). The ship is designed to transport bulk and loose cargo, including various types of ores, grain, apatite with specific cubic measure of cargo from 0.36 m^3/ ton and higher and also iron-ore concentrates with moisture content up to 15 percent.

The modernized ship will be loaded to a draft of 11.7 meters when transporting liquefied concentrates and in this case the cargo is taken into holds numbers 2 and 7 and also in the middle compartment of hold number 5. Further loading

*Printed with abbreviations. For complex text see SUDOSTROYENIYA, No 1, 1981.

of this cargo is limited by concepts of the overall longitudinal strength and stability of the ship.

Main Characteristics of Ship

Length:	
greatest	215.4 m
between perpendiculars	201.6 m
Width	31.8 m
Depth	16.9 m
Draft by summer loadline	12.3 m
Deadweight	52,700 tons
Registered capacity:	
gross	30,452 tons
net	18,945 tons
Main engine rating	10,076 kW
Loaded speed	14.7 knots
Navigation range (calculated)	15,000 miles

Some changes have been made in the design that concern the equipment and configuration of the power plant, pipelines and general ship and service systems and devices. Special attention was devoted to the technology of constructing the ship; the technological effectiveness of the hull, systems and pipelines were increased significantly and the conditions for performing finishing and electrical installation work were improved.

The lines of the hull and the structural division of it into holds, compartments and tanks were essentially left unchanged. Unlike ships of the first series, the drinking water tanks on new bulk carriers will be located under the power plant rather than in the double bottom and in the region of the tiller room, while their place will be taken by heavy fuel tanks. Some changes that ensue from the operating experience and need for technological simplification of designs concern the ship hull. Among them are some increase of the depth and thickness of the outer planking of the bow end and also attachment of it opposite the slamming, an increase of the ballast tanks under the decks in the region of the first hold, a change of the design of connecting the corrugations of the main transverse bulkheads to the "booths," use only of flat sections in the deck and wall structures of the superstructure and refusal to use 10KhSND steel to manufacture the structures of the inner bottom and outer planking in the region of ore holds Nos. 2, 5, and 7.

The 8DKRN 74/160-3 low-rpm diesel with rating of 10,076 kW at 1.9 s^{-1} will be installed on the first modernized ships as the main engine. After production of the highly economical new generation diesels of type L67GFCA with fuel consumption of 189-193 g/kW·hr has been organized, they will be installed on the ship. It is planned to use more powerful DGR 400/500-2 diesel generators with rating of 3 X 400 kW with regard to the increased consumption of electric power caused by the use of new equipment and an increase of living areas and social compartments. A turbogenerator with rating of 500 kW, powered by steam from the KUP 660/7-1 utility boiler, can be connected to the electric power plant while the ship is under way. An emergency diesel generator with

rating of 200 kW is provided for emergency steering drive. The volume of automation of the power plant will correspond to the requirements place on ships with the automation symbol A2 in the USSR Registry.

Significant changes were introduced during modernization to the structure of the anchor gear to increase its operating reliability. Special remote feed of the anchors from the wheelhouse and counting of the length of the paid-out chain were provided. Special accommodation ladders with storm ladders lowered from them will be installed instead of the mechanical lifts for the pilot, according to the requirements of SOLAS-74 and the International Association of Pilots. Seven automated electric berthing winches with tractive force of 122.6 kN will be used during berthing operations.

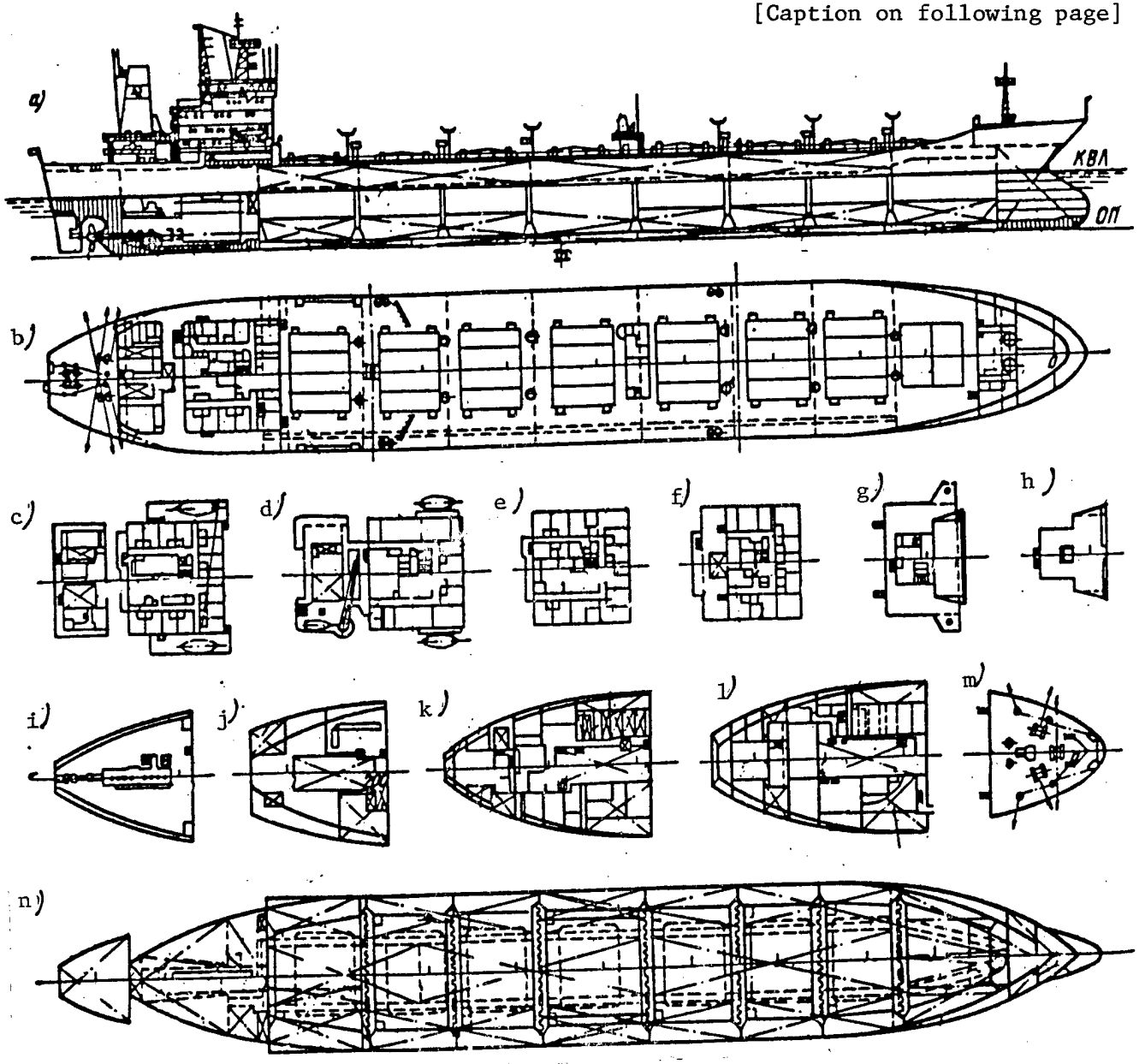
With regard to increasing the volume of the superstructure and to supplement the Briz-56 air conditioners, it is planned to install a Briz-30 air conditioner and to improve the climatic conditions in the TsPU [Central control console], it is planned to install a sectional KGTF 40/10 air conditioner instead of the assembled unit used previously. Waste-burning furnaces to process the wastes of petroleum products and solid waste are provided to fulfill the requirements of MARPOL-73 on modernized ships; moreover, containers will be used to collect waste. It is planned to equip the ships with the LK-50 installation to decontaminate drainage water. The system for collection, purification and delivery of oil-containng water will include a hold water separator and an automatic system for monitoring the oil content in water dumped over the side. The design of the channel-type ballast system is such that it permits ballast to be drained from the tanks under the deck below the level of the ship water line in ballast; the capability of receiving ballast only in these tanks is provided. The composition of radio communications and radio navigation equipment has been renovated during modernization of the ship.

Complete reconfiguration of the stern superstructure with separation of it into two units--living and engine--has been provided by the modernization project with regard to the increased requirements and new regulations on the working and recreation conditions of the crew. The level of comfort of the living, social and service rooms has been considerably enhanced.

The crew quarters, social rooms, recreation room, provisions stores, dispensaries, sports complex, a pool with platform for resting, a sauna, a workshop, service rooms and so on are located in the quarters block. The engine room shafts, the emergency diesel generator room, engine room blowers, waste-burning furnace room, welding room and so on are located in the stern block. The blocks are connected to each other by a bridge at the second level of the superstructure.

The entire crew is located in one-bunk cabins. Two-bunk cabins are provided for eight trainees. The number of block cabins for the officers has been increased. The cabins of the captain, senior engineer, and first and second mates are equipped with pantries and the captain's cabin is supplemented with a lounge.

[Caption on following page]



[Caption from preceding page]

Overall Layout of Ship: a--side view; b--top view; c--boat deck; d--first deck; e--second deck; f--third deck of superstructure; g--lower bridge; h--upper bridge; i--engine room; j--first platform; k--lower deck; l--second platform; m--forecastle deck; n--inner bottom

The insulation and panelling of the rooms are made of materials that meet the requirements of SOLAS-74. The structural fire protection of the ship has been improved significantly due to increasing the number of fire-proof structures. The ceiling covering in the living and social rooms and also the bulkheads in all cabins are constructed on the modular system; the bulkheads of the block cabins and social and service rooms will be protected by panels of nonflammable material, while the ceilings in service rooms will be protected with sheets of aluminum-magnesium alloy.

It is planned to construct the modernized ships at the Okean Plant, at which considerable experience has been accumulated in development of large-capacity ships. It is planned to form the hulls of the new bulk carriers from reinforced blocks in the drydock. Formation of a superstructure from two blocks will permit expansion of the front of installation work in the area adjacent to the dock. The power plant will include 22 functional units which will be manufactured in the shop and installed on the ship in assembled condition.

Thus, the operating capabilities of bulk carriers will be expanded and their habitability and technological effectiveness will be improved as a result of the modernization.

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BRIEFS

VOLGA-BALTIC NAVIGATION MAP--NAVIGATION-82 on the blue arteries of the north-west has come into its own. The first cargo ships of this year passed through the Volga-Baltic sluices yesterday. The vessels utilized navigation charts prepared by workers of the Chief Publication Office of internal waterway maps. Time has brought about adjustments in these documents. Cartographers are currently preparing an atlas of the single deep-water system in the European part of RSFSR, an edition dedicated to the renovated Volga-Baltic line. This encyclopedia of the blue roads will provide cartographic data and various information. The cartographers are taking into account the changes that the line has experienced in recent years. For example, at a number of sites two-way traffic has been opened, vessel traffic has been increased, and the channels deepened. This unique deep-water system of waterways ensures that both high-tonnage dry-load vessels and comfortable passenger liners will be used. The system has united the Beloye, Baltic, Azovskoye, Black and Caspian seas. [Article by L. Frolov] [Text] [Leningrad LENINGRADSKAYA PRAVDA in Russian 16 Apr 82 p 1] 9875

CSO: 1829/256

ROAD BUILDERS FROM UZBEKISTAN AT WORK IN TYUMEN

Moscow AVTOMOBIL'NYYE DOROGI in Russian No 5, 1982 pp 30-31

[Article by V. Valuiskiy]

[Text] Together with construction subdivision collectives from a number of Union republics, road builders from Uzbekistan are building highways in the Tyumen region. During the first three years of the 11th Five-Year Plan, they have undertaken to build with capital payments 100 km of automobile highways in Western Siberia.

A special department, Uztyumen'dorstroi [Uzbek Tyumen Road Construction] was organized within the Minavtodor [Highway Ministry] system in order to manage the road construction operations in Tyumen; it is now reorganized into a trust. In order to ensure that the builders will be supplied with food and industrial goods, an ORS [Worker Supply Department] was included in the trust.

Construction began as soon as road-construction machinery arrived at the building site. Results of these operations can be viewed as having initial success: 20 km of operational roads were ready one month ahead of schedule as set forth by the 1981 plan. In addition, construction operations in excess of plan and at a cost of 403,000 rubles have been completed.

The builders are at home at the new site--a settlement of trailer dormitories has appeared. These trailers were manufactured by the October Experimental Mechanical Maintenance Plant No 7 of the Minavtodor collective. Two two-unit houses, two 16-unit houses and two dormitories with 103 spaces each have been opened for use. The residential fund originally set up provided living quarters for only 350 builders. Today, the fund has been expanded--almost 1500 builders that work in Tyumen have living quarters.

An industrial base has been established: boiler unit, transportable electrical station, various types of warehouses, saw frames, GSM [flammable lubricating materials] storehouse, parking lots, etc.

Road construction is being carried out under complex hydrogeological conditions and with an absence of local construction materials.

For this reason, at the Kuilyuk experimental plant for reinforced concrete pavement structures in Tashkent, the largest of Minavtodor concerns, the problem of supplying the Uzbekistan road builders contingent with construction equipment is being worked on, as well as supplying them with reinforced concrete slabs for covering the roads. It is known here that under northern conditions, top durability slabs are required. The present goal of the plant's collective is to supply not only quantity but high quality products as well. To this end, in order to assure production of the necessary quantity of slabs, a departmental reorganization was initiated.

By end of 1980, a successful resolution of production issues at this plant allowed the plant to send the Uzbek road builders working on the highway in Tyumen more than 10 thousand m^3 of reinforced concrete products.

Operations are proceeding well. The mandate of the Uzbekistan workers to increase the glory of the republic's road builders in Tyumen is being successfully fulfilled. Construction of the road is ahead of schedule. This has been promoted by a constant search for reserves and improvement of technology.

Many machine operators and drivers have sought to make a significant impact on the operation. N. Sh. Baliakhmetov, M. Kh. Karimov, I.G. Cherkaikin, R. Kadyrov and others have provided examples of shock labor. They supported the initiative of 15 distinguished workers of Uzbekistan to fulfill 10 and more annual norms during the 11th Five-Year Plan, and gave their word to complete two five-year programs during the Five-Year Plan. The followers of the patriotic initiative are true to their word--they fulfill two norms each day.

Recently, the united board of the Uzbek SSR Ministry of Construction and Management of Automobile Highways, and the branch professional union of the republic awarded first place to the working contingent, and presented them with the Red Challenge Banner and a monetary premium. The board ruled that names of many of the road builders be placed on the republic's board of honor.

Today, the road builders are making good progress toward fulfillment of the second year program of the Five-Year Plan, during which it will be necessary to present 40 km of the completed "Siberian" automobile highway and complete construction operations costing 20 million rubles. This will be a fitting gift to the motherland in honor of the 60th anniversary of the formation of the USSR.

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IMPERFECT DESIGNS DELAY ANTICIPATED PRODUCTION FIGURES

Moscow AVTOMOBIL'NAYA PROMYSHLENNOST' in Russian No 5, May 82 pp 1-3

[Article by G. B. Kats, candidate of engineering sciences, and A. A. Neveler, candidate of economic sciences, MAMI (Moscow Automotive Engineering Institute): "Unused Potential for Increasing the Efficiency of New Automotive Equipment From the Standpoint of the National Economy"]

[Excerpt] To be specific, during the 11th Five-Year Plan about 100 new models of automotive equipment are scheduled to be put into production, the production of motor vehicles and truck tractors with diesel engines is to be doubled, and that of highway trailers increased 1.4-fold, and the production of special trucks for agriculture and dump trucks with high carrying capacity for the fuel and mining industries is to be organized. This will make it possible to increase the productivity of motor transport in the economy by 30 percent, to make about 500,000 drivers available, to save at least 40 million tons of motor lubricant and fuel, and to reduce the labor intensiveness of servicing 20 percent.

If assignments like these are to be performed, the time required to create, put into production and apply automotive equipment will have to be reduced. This has been stated very straightforwardly in the "Basic Directions for the Economic and Social Development of the USSR Over the Period of 1981-1985 and Up to the Year 1990": "Accomplish a further acceleration of scientific-technical progress. Increase the effectiveness of scientific research, reduce substantially the time required to apply the advances of science and technology to production."

Among the most important measures tending to reduce the period of time required to master and put new models of automotive equipment into regular production is the working out of a design for each type of product which guarantees attainment of the planned volume of output and other economic indicators in the first year of its production.

In practice, unfortunately, a rather long period of time passes as a rule from beginning of development to full attainment of rated capacity in production of a new motor vehicle model, and sometimes the model is becoming obsolete. Consequently, the time during which it yields its maximum savings for the given stage of technical development is shortened. The principal reason for this

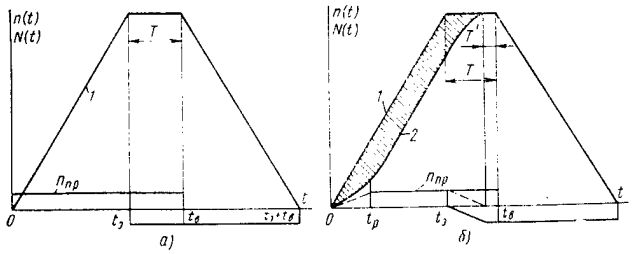
situation is that in planning projects to create and apply new equipment the time allotted to developing the design proves to be insufficient in many cases. As a result a design which essentially has not been finished is passed on to the production sector, undergoes numerous changes and finishing touches in the stage of production engineering and in the production process itself. (The experience in putting the Moskvich 2138 and Moskvich 2140 automobiles into production can serve as an example of the ineffective planning of projects to create and apply new technology.) Moreover, a consequence of this practice is that the planned labor intensiveness in manufacture of the motor vehicle, incorporated in the design, is achieved 3-5 years or more after its series (large-scale) production has begun. For example, even at such a progressive plant in the industry as the Moscow Motor Vehicle Plant imeni I. A. Likhachev the process of reducing the labor intensiveness of the ZIL-130 from 900 to 240 output-hours took about 5 years, and at the Gor'kiy Motor Vehicle Plant they managed to reduce the labor intensiveness on the GAZ-53 from 520 to 140 quota-hours only after more than 5 years had passed. Almost the same pattern has been observed with respect to many other vehicles: the present labor intensiveness in manufacturing the UAZ-450A model took 6 years to achieve, for the Volga M-21 6 years, for the ZAZ-965--5 years, and so on. The same thing can also be said concerning manufacturing costs per unit output. As experience has shown, over 5 years they have decreased as follows: labor costs--2.5-3.5-fold, consumption of basic and auxiliary materials--15-20 percent, losses from rejects--10 percent, and expenditures for jigs, tools and fixtures approximately 5 percent.

There is nothing surprising about the change of costs under the impact of technical progress--new equipment, new technology and new organization of production. But costs incurred because the vehicle design passed on to the production sector is in a number of cases manufactured for a lengthy period with temporary technology are essentially losses to the economy. The ways to reduce them are suggested by an analysis of labor intensiveness and costs for standard stages (operations) in technical preparation of production at a number of enterprises in the industry. It shows, for example, that at those enterprises where the outlays for design (technical assignment, engineering conception and working drawings) comprise less than 20 percent of all the costs of development (including manufacture and testing of experimental prototypes), subsequent finishing touches on drawings and the technical documentation as a whole are considerably more expensive (in a number of cases as much as 200 percent) than the designing itself. Wherever the design costs comprise 30 percent or more of the total cost of development, the costs of additional work on the design are far lower and do not exceed 50 percent of the design cost. Consequently, there is an urgent need to increase or redistribute appropriations to the advantage of the design stage, i.e., a need for higher quality and greater completeness in the drafting of drawings and all the technical documentation.

These are, so to speak, general considerations. They are confirmed by the experience of plants, the Gor'kiy Motor Vehicle Plant in particular. In the recent past its cycle from the beginning of research to retirement of the vehicle from service and termination of the supply of spare parts has been distributed as follows: resear ... [line missing in text] ... 4-6 years;

attainment of rated output in manufacturing--3-4 years; production--10-12 years, i.e., 17-22 years passed from when work began to create the new model to when its production was terminated, including 7-10 years for the first two stages. The GAZ-AA can serve as an example: its designing began in 1928, it was put into production in 1932, it was withdrawn from production in 1949 and the supply of spare parts was terminated in 1958, i.e., the life of the GAZ-AA was 25 years. For the GAZ-51 this period proved to be 27 years, for the Pobeda M-20 30 years. Is this good, or does it fall short? It is good if we examine the matter from the standpoint of the smooth flow of production, stability in fulfillment of the production program, and the vehicle's prestige with the consumer. But it turns out that manufacturing one and the same model over a lengthy period of time is not always justified. The point is from the moment when the number of vehicles of a given model produced becomes equal to the number of those written off, the rise of the economic benefit in the national economy from operation of that model is dropping. This occurs when the first production runs of the vehicles reach the end of their assigned running life: in practice, if the model is not modernized, then this is not long before it is removed from production. (Of course, the period for obtaining the additional benefit may be extended by timely updating of the design.) That is why from the standpoint of national economic efficiency one should strive to bring the moment of obtaining the maximum economic benefit closer to commencement of manufacture of a new model, i.e., reduce the period of time during which that model is manufactured. And this, as we know, depends above all on the quality and rates of R&D and the length of time it takes to bring production up to rated output.

The influence of the time required to organize production of a model of a vehicle on the size of the economic benefit during its use can be traced by analyzing the graph presented in Figure 1 (plotted without taking into account the costs of preparing production).



[Figure 1]

For the most favorable case, i.e., when the rated output is attained in the first year of production, the increase of the fleet of vehicles (and consequently the economic benefit as well) will occur along top curve 1 (Figure 1a), and the maximum economic benefit in the national economy will be obtained in the time T. In organizing production of vehicles according to a linear law (as is usually the case in practice) and attainment of rated output in the time t_p years, the growth of the fleet will occur along curve 2 (Figure 1b), and the maximum economic benefit will be obtained in the time T', i.e., in approximately one-fourth the time as in the first case. The economic benefit

not obtained (losses) in the national economy from operating vehicles of this model because of extension of the period of organizing production is represented by the shaded area (Figure 1b). Calculations show that compensation of those losses would require an additional approximately 10 percent annual output of vehicles of this model. For example, if the rated capacity is 100,000 vehicles per year, and it is achieved in 3 years, in order to offset the losses it would be necessary to manufacture an additional 17,000 vehicles or so per year, if rated output is achieved in 2 years, then only 11,000. If rated output is 50,000 vehicles per year, and it takes 3 years to reach that output, it would take an additional 7,000-10,000 vehicles to offset the losses.

Now let us assume that it costs 1,000 rubles to manufacture one vehicle. Then the direct saving of resources by shortening the period for reaching rated output from 3 to 2 years will be 7 million rubles in the first case and 6 million in the second. The larger the enterprise's production capacity, the greater this saving will be.

These examples demonstrate that extension of time for organizing production actually causes a substantial reduction of the economic benefit from application of a vehicle model in the economy. In performing the tasks set by the 26th party congress, then, motor vehicle builders should improve the process of designing new automotive equipment and should use more efficient (progressive) methods of preparing production so as to achieve maximum reduction of the time for organizing production and the period between commencement of production of new models of automotive equipment and the moment when the economic efficiency of their use in the economy reaches the maximum.

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MULTIAXLE FULL-DRIVE TRUCKS ON ARCH TIRES OR ROLLER TIRES

Moscow AVTOMOBIL'NAYA PROMYSHLENNOST' in Russian No 5, May 82 pp 9-11

[Article by V. A. Petrushov, doctor of engineering sciences, et al., NAMI (Central Scientific Research Institute of Motor Vehicles and Engines)]

[Text] Over the last 10-15 years important R&D projects have been carried out in the world automotive industry to build vehicles for the most difficult conditions for cross-country travel in regions being developed. One of the effective methods of increasing the cross-country capability and tractor-trailer performance of trucks is to mount tires on them with low internal pressure--arch tires and roller tires [1]. But arch tires and roller tires do not as a practical matter fit with the standard steered and driven axles of series-manufactured trucks--mainly because an intolerably large distance is formed between the axis of the king bolt and the longitudinal plane of the wheel, the angle of rotation of the wheels around the king bolt is restricted, and the overall width of the vehicle is large. In other words, such tires can be mounted only at the price of a substantial complication of the running gear, which increases its cost and does not allow for standard compatibility with series-manufactured vehicles. That is why selection of an optimum design scheme of the running gear to afford maximum interchangeability of trucks being developed with tires of this type with series-manufactured trucks is of great practical interest.

A comparative analysis made in NAMI of a number of versions of different basic schemes of the running gear and chassis of the truck as a whole made it possible to adopt a scheme of a chassis with a hinged frame as the basis for further development. This conception makes it possible to make transmission and running gear assemblies of trucks on tires with low internal pressure compatible with the assemblies of series-manufactured trucks. To be specific, the articulated design of the chassis makes it possible to install fixed driven axles and suspension of a standard type; consequently the vehicle turns by virtue of the relative turn of the front and rear sections of the frame in the horizontal plane by means of sufficiently strong power steering.

Experimental prototypes of 6x6 and 8x8 versions of the articulated trucks (with the hinged frame) and truck trains based on them, equipped with both roller tires and also arch tires, wide tires or doughnut-shaped tires (Figures 1-3) have been developed in NAMI.

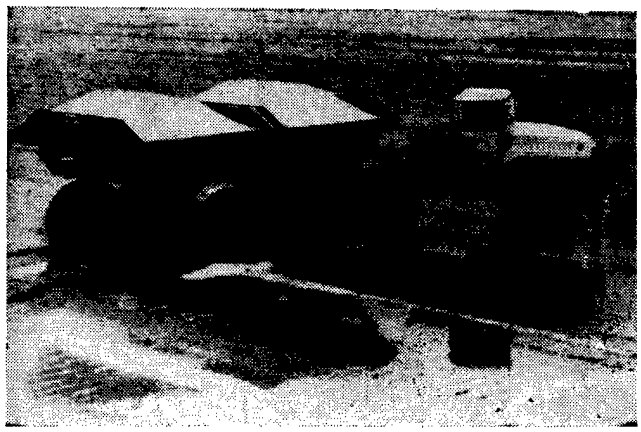

Figure 1. Dump truck train on roller tires carrying solar salt in the evaporation pond of a salt-making operation.

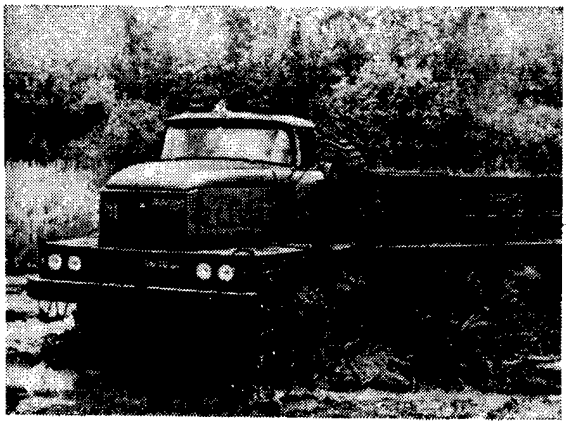

Figure 2. Articulated truck on arch tires making its way through a boggy section.

Figure 3. Truck train on roller tires consisting of articulated 8x8 tractor and twin-axle log trailer carrying pipe and pipe sections in the desert.

The 8-ton dump truck train on 1,200x1,200-500 roller tires consists of the three-axle articulated tractor and the two-axle inactive self-dumping semi-trailer. The tractor was developed from the Ural-375S truck. Its front wheels do not turn; a hinge with 1° of freedom has been introduced into the design of the frame. The principal original assemblies of the truck train are the hinged articulation of the frame of the tractor and the wheel assembly.

The low pressure on the ground (0.03 MPa) allows the truck train to maintain traction in salt evaporation ponds either on the clayey bottom of the pond or on the layer of salt, and the hinged design of the frame makes it possible to turn with a smaller radius than the original truck in spite of the wide wheels.

Figure 3 shows the articulated 8x8 truck developed by NAMI on roller tires whose size is 1,200x1,200-500, which is used as the tractor in a truck train for carrying pipe and pipe sections (up to 36 meters long and diameters up to 1,420 mm) in difficult terrain. The truck train's load capacity is 14 tons. Most of the assemblies and units are series-manufactured by the domestic motor vehicle industry.

In the process of creating and researching articulated trucks much attention was paid to guaranteeing their steerability and steadiness of direction at high speeds.

Computational functions were worked out that made it possible in the design stage to determine the required relationships between the dimensional and weight characteristics of the front section of the truck so as to stabilize straight-line movement and also to estimate the magnitude of the maximum moment of resistance to turning of the articulated truck, which is the initial parameter in calculating steering. As a result of the research work and additional refinements in the steering system of the 8x8 articulated trucks, the parameters of their steerability and directional steadiness were judged to be fully satisfactory at speeds all the way up to the maximum speed (85 km/hr).

The design approach that was taken made it possible to create prototypes of multiaxle trucks with wide tires and low internal pressure on all axles on the basis of the technical solutions worked out as well as trucks using the units and assemblies of series-manufactured trucks. We managed to give the truck an overall turning radius of less than 11 meters and also to simplify the design and improve the reliability of the running gear by eliminating the axles with steered wheels and by applying, in particular, two identical balancing undercarriages of the series-manufactured three-axle Ural-375 trucks for trucks of the 8x8 type. The experience acquired in creating and studying the articulated trucks on the basis of units of the Ural trucks makes it possible to pass on to development of articulated trucks of greater load capacity.

Let us examine the results of comparative studies of certain performance characteristics of the articulated 8x8 trucks on roller tires (Truck A) and arch tires (Truck B); series-manufactured 6x6 trucks with high cross-country capability on wide tires (Truck D) and doughnut tires with regulated pressure (Truck E), as well as a mockup of an 8x8 truck on roller tires with a turning front undercarriage and quadrant (gitarnyy) wheel drive (Tractor C), which

differs from Truck A in having a greater ground clearance. The parameters of the trucks tested are given in the table. The roller tires and arch tires had a "oblique segmented fir" tread pattern with low lug density. The height of the lugs on the roller tires is 20-25 mm, their angle of inclination is 15°, and the spacing interval in the middle of the track is 125 mm.

Parameters	Truck A (C)	Truck B	Truck D	Truck E
Wheel formula	8x8	8x8	6x6	6x6
Tires:				
Type	Roller tires	Arch tires	Wide tires	Doughnut tires
Size	1,200x1,200-500	1,300x750	1,300x530-533	14.00-20
Number of plies	4	8	12	10
Range of air pressure regulations in the tires adopted in the tests, MPa	0.04-0.10	0.05-0.25	0.10-0.35	0.05-0.32
Distribution of load to the road, kg:				
Through the front axle (6x6), the front undercarriage (8x8)	10,000 (8,800)	10,000	5,500	3,900
Through the rear undercarriage	10,000 (8,800)	10,000	14,200	9,300
Ground clearance under the main transmission housing at nominal tire pressure, mm	410 (670)	410	360	410
Specific power, kw/ton, when the truck was tested:				
Alone	8.8 (10.0)	8.8	9.0	9.7
In a truck train with log trailer	5.1 (--)	5.1	5.1	--

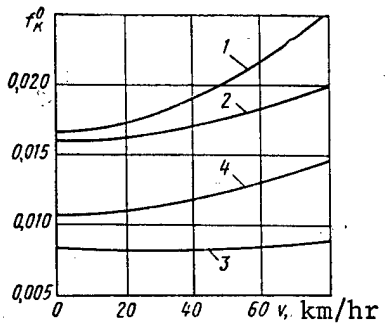

Figure 4. Functional dependence of the coefficient of resistance to rolling of tires of driven wheels on the speed: 1--Truck A (p_w = 0.1 MPa); 2--Truck B (p_w = 0.25 MPa); 3--Truck D (p_w = 0.35 MPa); 4--Truck E (p_w = 0.32 MPa).

Travel on Hard-Surface Highways. The inertia method (stopping distance method) was used for comparative determination of tire rolling losses on a level hard surface. The experiments were conducted while the trucks being compared were moving along a concrete highway. On the basis of the results of the tests the coefficient of resistance to rolling of the roller tires (Figure 4) turned out to be slightly higher than that of the arch tires.

The influence of the roller tires on the speed performance of the truck in moving on an uneven hard surface was evaluated during comparative trips of Truck A, Truck D, which had the same power plant and full weight, and Truck E on level and grade sections of the cobblestone road of a vehicle testing ground [2]. In order to take into account how the length of travel affects the driver, the length of the run in the test trips was set close to the driver's assignment for one shift (less than 250 km). The average speed of Truck A on the level was 55.4 km/hr, and on the grade 48.8 km/hr, which is 59-63 percent more than for Truck D and 32 percent more than for Truck E. This advantage is explained by the great smoothness of the run of Truck A thanks to the greater smoothing and absorbing capabilities of the roller tires; they substantially reduce the high-frequency vibration caused by the effect of the unevenness of the road, vibrations which limit the speed with respect to the criterion of the driver's comfort.

Travel Over Virgin Snow. In this case the truck's maximum cross-country capabilities were determined when it traveled over horizontal sections covered with dry fine snow with a density of 0.292 grams/m^3, without crust. When the snow was 26-52 cm deep, the Trucks A, B and E maintained their ability to move at speeds of 7-10 km/hr and could be handled with confidence. At a greater snow depth their cross-country capabilities were limited by the snow drifts and by the front axles and wheels, which heated up greatly. But Truck B was able to move without stopping in snow to a depth of 74 cm even at maximum cross-country capability, whereas Truck A was able to move only by backing up (by "making a track"). The depth of the track after the truck passed on the roller tires, in spite of its worsened cross-country capability, was 57 cm, while after passage of the truck on arch tires it was 60 cm. Consequently, the greater rolling losses of the roller tires results from their width, which is why the roller tires show a greater resistance to movement in snow (especially unpacked snow in which the track is deeper). The maximum cross-country capability of Trucks D and E was practically the same.

Comparative tests were run to evaluate how the height of the ground clearance affected the cross-country capability of Tractor C and Truck D. Tractor C lost cross-country capability at a snow depth of 80 cm; Truck D, which had no essential contact between the gear case and the snow, retained its ability to move steadily. Thus the proposal expressed in [3] to the effect that 8x8 trucks on 1,200x1,200-500 roller tires and a load of 2,000-2,500 kg on the tires could be used effectively in virgin snow up to 1.0-1.5 meters deep was not confirmed.

The bearing and traction performance of all the trucks tested on the tires being compared, including the roller tires, did not guarantee movement over the surface of a deep snow cover at the loads indicated in the table. At the same

time the increased width of the track formed by the roller tire, which is a consequence of a relationship of the width of the roller tire being tested to its diameter, which is unfavorable for these conditions, considerably incresed the resistance to rolling.

When the depth of the snow cover was reduced to 20-25 cm Truck A overcome grades up to 40 percent, and Truck E failed them because it lacked the traction. The two crawler tractors tested under these conditions, which had an average ground pressure of 0.02 and 0.06 MPa, showed an ability to overcome the grades equal to that of Truck A.

Movement in Boggy Localities. Trucks B, D and E were unable to move through a section of boggy meadow because the wheels cut into the turf, while Truck A moved confidently through it, doing so, moreover, several times in its own track.

The truck's ability to move through bogs on roller tires is affected by the height of the ground clearance--when the turf is caught by the driven wheels, Truck A quickly lost its ability to move because the axles were scraping the cut turf and grass. Tractor C had a real advantage under these conditions, since its clearance under the gear boxes, increased to 260 mm, made it possible for it to move when the depth of the track was 80 cm, where even S-100 tractors failed.

Tractor C's maximum cross-country capability in a boggy locality overgrown with reeds and a floor cover of peat was determined by comparison with a personnel carrier on crawler tracks. The tractor destroyed the vegetation as it moved until the undercarriages scraped the vegetation and the boggy soil, and it ceased to make headway because the roller tires were spinning. Only a personnel carrier on crawler tracks, which had a ground pressure of 0.02 MPa, was able to get through the mud.

Movement Over Wet Loamy Soil. Trucks A and E were put through strenuous and lengthy trips after long rains on a test track with grades up to 15 percent where the depth of the wet soil was 12-16 cm. Under these conditions, because of the low ground pressure, the roller tires interacted only with the upper extremely wet layer of soil, but the doughnut tires formed a track that guaranteed more reliable traction with the dense underlying layer. As a result the average speed of Truck A was 20-25 percent lower than that of Truck E.

In traveling up grades on a wet turfy surface the roller tires made it possible for Truck A to confidently overcome grades up to 55 percent without destroying the turf thanks to the wide bearing area, whereas the wheels of Truck E cut the turf and began to spin, and then movement became impossible. As a result Truck E was able to overcome grades 10-15 percent less than those managed by Truck A.

Movement on Dry Loose Sand. Experiments were conducted using Trucks A and B with koniki for carrying pipe as part of pipe-carrying truck trains with twin-axle log trailers equipped with the same tires as the tractors on the route of the gas pipeline in the Kyzyl-Kum Desert. The conditions of the basic sections

of the tests were as follows: barchan sand with no solid base, dry, loose, not packing in the track. The principal difficulty in movement is overcoming the grades (two or three per kilometer) represented by the natural barchan some 100 meters in extent, which go up to 25 percent. The usual pipe-carriers built on the basis of series-manufactured three-axle trucks with high cross-country capability were unable to make grades higher than 5-10 percent when loaded because they lacked traction. Accordingly, for production purposes the pipe was carried with T-100M tractors and wheeled log trailers. The truck trains made up with Tractors A and B carried pipe sections (pleti) of the same weight as the tractors, but at a speed 2.5-fold greater, and fuel consumption was between one-fourth and one-fifth as much.

On the basis of the averaged performance data obtained in a section with grades up to 25 percent, the average speed of the truck train on roller tires loaded with pipe section weighing 13 tons was 19.1 km/hr, which is 20 percent more than that of the truck train on arch tires, and fuel consumption was 28 percent less.

Comparative tests of these truck trains with pipe and pipe-section carriers on wide tires (Truck-Tractor D), which had the same power plant, full weight and load weight were conducted in a sandy area 33 km long in which this kind of pipe carrier could move, since the grades did not exceed 10 percent. The truck train's average speed on roller tires was 19.0 km/hr, which is 18 percent greater than the movement of the truck train on arch tires and 31 percent higher than the speed of pipe-carriers on wide tires. Fuel consumption of the truck train on roller tires was 59 percent lower than that of the truck train made up with Truck C and 78 percent greater than that with Truck D. The reason for this is the lower resistance to the movement of roller tires in the sand and also the differing operating regimes of the engines; Tractors B and D moved a longer time than Tractor A in the lower gears because speed had to be kept down to maintain smooth travel because of the large number of small barchans and troughs in the sand. The amount of resistance to movement of the pipe-carriers on wide tires under these conditions can be described by the absolute fuel consumption: it exceeded 7.3-fold the monitored fuel consumption of Truck D when it moved alone on the highway.

Thus the results of the research have shown that the articulated design of the chassis made it possible to create prototypes of multiaxle full-drive trucks on wide tires while at the same time observing the principles of continuity with series-manufactured trucks which have high cross-country capability; they are suitable for comprehensive evaluation of their operating abilities and for the drafting of specific industrial recommendations.

The combination of operating characteristics, which on the one hand guarantee cross-country capability over soils comparable to the cross-country capability of a crawler track assembly with ground pressure of 0.04-0.06 MPa and on the other the possibility of moving on hard-surfaced roads at speeds of ordinary trucks without damaging the pavement (by contrast with the crawler assembly with its metal tracks) should be regarded as the principal advantage of trucks of this type on roller tires.

Tests of the four-axle trucks which have been developed on roller tires (run of 10,000 km) and arch tires (run of 38,000 km) showed that assemblies of these types can feasibly be applied on transport routes with relatively small share of travel on hard roads; in particular because of the increased rolling losses under these conditions. The greatest benefit from applying these roller tires as compared to other tire types with high cross-country capability was obtained in operation on loose sandy soils. Use of roller tires on superwet soil with a bound plant cover was also effective, but more limited. The cross-country capability of trucks on the roller tires which were studied under a variety of cross-country conditions corresponds to the cross-country capability of trucks with variable-pressure tires and arch tires or fails to meet it (low-density snow cover, wet loamy soil).

The design of the articulated trucks which were developed makes it possible to use all four types of tires (roller tires, arch tires, wide tires, and doughnut tires) interchangeably, which in the future could increase the degree of adaptability of these trucks to operation under different operating conditions merely by changing the wheel assembly.

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